34

NINTH BIENNIAL REPORT

1960-1961

Louisiana Wild Life and Fisheries Commission

NINTH

BIENNIAL REPORT

Louisiana
Wild Life and
Fisheries Commission
1960 - 1961

Published by

Louisiana Wild Life and Fisheries Commission
Wild Life and Fisheries Building
400 Royal Street
New Orleans 16, Louisiana

LOUISIANA STATE UNIVERSITY
LIBRARY

State of Louisiana

WILD LIFE AND FISHERIES COMMISSION
126 CIVIL COURTS BLDG.
NEW ORLEANS 16

L. D. YOUNG, JR.
DIRECTOR
RICHARD K. YANCEY
ASSISTANT DIRECTOR

E. R. McDONALD, SR.
CHAIRMAN
NEWELLTON
RAY A. WHATLEY
VICE-CHAIRMAN
ALEXANDRIA
JOHN PAUL CRAIN
GRAND CHENIER
JOHN J. CUTRONE
MORGAN CITY
A. J. BUQUET
HOUMA
L. RICHARD FLEMING
SHREVEPORT
JAMES J. FREY
LAFAYETTE

May 1, 1962

TO THE GOVERNOR AND MEMBERS OF THE
LOUISIANA LEGISLATURE

Gentlemen:

Accompanying this letter is the Biennial Report of the activities of the Louisiana Wild Life and Fisheries Commission covering the calendar years ending December 31, 1960 and December 31, 1961.

It is with a sincere sense of pride that the Commission submits this report of its activities and accomplishments. Progress in wildlife conservation is evident and the people of Louisiana are reaping benefits from this program of work.

Respectfully submitted,

L D Young Jr

L. D. Young, Jr.
Director

LOUISIANA WILD LIFE AND FISHERIES COMMISSION

E. R. McDonald, Sr., *Chairman*	Newellton
Ray Whatley, *Vice-Chairman*	Alexandria
A. J. Buquet	Houma
John Paul Crain	Grand Chenier
John Cutrone	Morgan City
L. Richard Fleming	Shreveport
James J. Frey	Lafayette

L. D. Young, Jr.
Director

R. K. Yancey
Asst. Director

DIVISION CHIEFS

Ellis C. Irwin
Attorney

Steve Harmon
Chief, Education & Publicity

Rudolph Easterly
Chief, Law Enforcement

John D. Newsom
Chief, Fish and Game
and
Pittman-Robertson Coordinator

James N. McConnell
Chief, Oysters, Water Bottoms
and Seafood

Harry Schafer
Dingell-Johnson Coordinator

Ted O'Neil
Chief, Fur Division

Kenneth Biglane
Chief, Water Pollution Control

Roy B. Schaefer
Chief Accountant

R. K. Yancey
Acting Chief, Refuge Division

TABLE OF CONTENTS

PAGE NUMBER

ADMINISTRATION DIVISION 1

Accounting Section 7

Aviation Section 25

The Wharf 27

INFORMATION AND EDUCATION DIVISION 31

Education Section 34

ENFORCEMENT DIVISION 39

FISH AND GAME DIVISION 47

Aquatic Vegetation Control 48

Drafting 52

Predator Control 53

River Basin Studies 53

Game Section 58

Fisheries Section 110

Fish and Game Organization Chart 137

FUR DIVISION 139

OYSTERS, WATER BOTTOMS, SEAFOOD DIVISION 143

Marine Biological Section 145

Crawfish Farms Map 165

Coastal Waste Control 168

REFUGE DIVISION 171

Rockefeller Refuge 173

Marsh Island Refuge 178

Pass-a-Loutre Management Area 179

State Wildlife Refuge 183

Coulee Wildlife Refuge 184

Refuge Research 186

WATER POLLUTION CONTROL DIVISION 195

Digitized by the Internet Archive
in 2011 with funding from
LYRASIS members and Sloan Foundation

http://www.archive.org/details/louisianawildlif09depa

Administration Division

L. D. YOUNG, JR.
Director

R. K. YANCEY
Assistant Director

IT IS GRATIFYING to report that the past biennium has been one of marked progress for the Louisiana Wild Life and Fisheries Commission. During the past two years, which will be covered in detail by various divisions of the Commission elsewhere in this report, many important objectives of the Commission have become realities.

While completing the program instituted by men who preceded us, we have also initiated new projects and now see them in operation. Similarly, there are additional long range projects on the planning boards.

R. K. YANCEY

L. D. YOUNG, JR.

Both educational and recreational demands have greatly accelerated the pace, and widened activities of the Commission and its personnel. During the years ahead, plans that are now on the drawing tables of management will become realities.

Before dealing with some of the many highlights marking the past biennium, it would be remiss not to point out that the citizenry of Louisiana have sanctioned by ballot three times their desire for a Commission form of wildlife and fisheries management.

I keenly feel, as do the people of Louisiana, that administration of Louisiana's unexcelled wildlife and fisheries resources can be properly compared to fine teamwork. It has been my pleasure and privilege of working with two groups of Commissioners.

Combined interest, enthusiasm and knowledge of the members of the Commission are greatly responsible in conserving, managing and utilizing wildlife resources that are vast and varied.

E. R. McDonald, chairman of the Commission during the administration of Governor Earl K. Long and now Governor Jimmie H. Davis, goes far beyond what might be considered normal obligations of his position. His knowledge of the needs, complexities of problems and responsibilities, and his dynamic but understanding approach to all the demands of his position will be historically noted as a successful milestone in the annals of conservation efforts in Louisiana.

Other members of the Commission have focused their attention and abilities to the end that every phase of the present broad wildlife and fisheries management program has benefited.

Ray Whatley, Commission Vice-chairman; John Paul Crain; John Cutrone; William S. Denton; L. Richard Fleming; and James J. Frey, have all given unselfishly of their time and effort to a cause in which they so firmly believe, and in which the people of Louisiana have such a vital stake.

At the present time, A. J. Buquet, Houma, is serving on the Commission. He succeeded Mr. Denton on December 10, 1961. The Commission is fortunate in having Mr. Buquet serving with it. He is well known throughout the state for his vital interest in sound management of wildlife and fisheries resources.

It is not my intention to elaborate in detail on the activities of each division of the Commission. Every phase of wildlife and fisheries management and utilization is covered thoroughly in the pages of this report. Rather, I would prefer to single out some of the most urgent and stimulating activities of the Louisiana Wild Life and Fisheries Commission. They are varied and thought-provoking. I feel certain they will create interest in, and fuller appreciation of, the efforts of the Commission and its highly trained personnel.

Well over 100,000 persons will have visted the Louisiana Wildlife Museum at 400 Royal Street, in New Orleans, by the time this biennial report is distributed. This tremendous influx of persons has taken place during the time elapsed since February 27, 1961, when the museum was dedicated and formally opened by Governor Jimmie H. Davis and members of the Commission.

RAY WHATLEY

E. R. McDONALD, SR.

At that ceremony, hundreds of persons were on hand for the ribbon-cutting. Groups visiting the museum since its opening have come from all sections of the state; often combining a museum tour with a visit to the historic Cabildo, former seat of Spanish government and long the venerated Louisiana State Museum.

The museum has also attracted persons from every state in the United States and from 39 foreign countries. Full details of the museum's extensive, and in some cases priceless, exhibits will be found in another section of this report.

Considered one of the finest wildlife museums in the country, the museum is to be enlarged when funds permit to include a Gulf Marine Hall. It will consist of four principal exhibits. Two sections will depict underwater groups of Gulf fish. Another will be a beach group, and the fourth will show the species of fish that concentrate around a gulf offshore drilling rig. The educational value of the hall, like the relatively new museum, will be both unexcelled and outstanding.

Still in the educational aspects of carrying the story of Louisiana wildlife and fisheries, along with the rich heritage of natural resources and the role they play in wildlife management and

JOHN PAUL CRAIN

JOHN CUTRONE

WILLIAM S. DENTON

usage; I would like to mention the wildlife lecturers' program.

Highly-trained and fully-oriented lecturers are appearing before school groups, sportsmen's groups, church groups, civic associations, Boy Scout and Girl Scout gatherings, and many other interested organizations. Fully equipped with movie projection and slide projection visual aids, wildlife films, and first-hand information gained in the field, these Commission personnel are traveling throughout the state bringing the story of Louisiana wildlife to all who are interested.

The tremendous impact of this program has already been noted. As an integral part of the Louisiana Wild Life and Fisheries Commission's educational activities, the work being done by Commission-trained lecturers will have a lasting effect upon upcoming generations, as well as upon their elders.

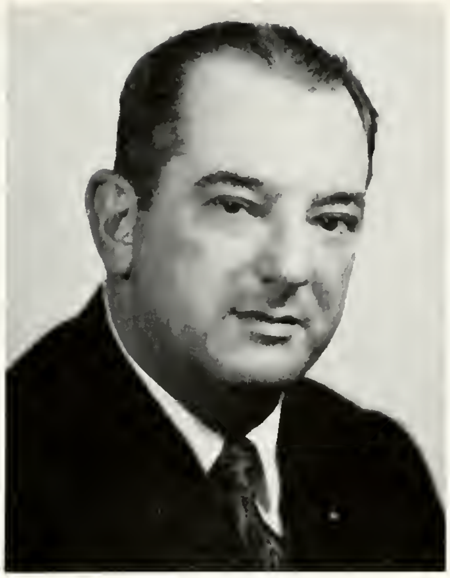
This is a grass roots campaign that will carry the message of management, conservation and utilization to all who are interested. That interest is great can be easily seen in the mounting number of requests asking for programs by lecturers of the Commission.

Many of the wildlife lecturers are booked several months in advance. This is mute but significant enthusiasm for this program which is wholeheartedly endorsed by the Louisiana State Board of Education and hundreds of other educational and conservation leaders throughout the state. Present planning calls for additional mobile exhibits to be used by the lecturers. This will consist of mounted animals, fish, reptiles, and, in some cases, live animals.

L. RICHARD FLEMING

JAMES J. FREY

A. J. BUQUET



ELLIS IRWIN
Chief Attorney

A. A. SIKES
Administrative Assistant

Activities of the Commission necessarily have been broadened to meet the demands of both commercial and recreational interests whose stake in wildlife management and usage have climbed apace with industrial development. The activities referred to run the gamut from control of noxious weeds to parasite research in game and game birds.

Industrial pollution of both inland and coastal waters has called for more attention. This pollution, sometimes unintentional and on rare occasions deliberate, can be expected to increase in the years ahead. However, this problem has been met head on and it has been proved that industry and wildlife can work hand in hand.

In singling out a few of the highlights of the past two years, I am gratified to report that the Louisiana Wild Life and Fisheries Commission undertook a long-range program of land acquisition by purchase of 15,000 acres now known as the Russell Sage Wildlife Management Area. The hardwood tract is located principally in Ouachita Parish, with small acreage extending into Richland and Morehouse Parishes.

Dedicated in July, 1961, this management area became the first state-owned wildlife management property since acquisition of Pass-a-Loutre in 1926. It marked a forward step toward preservation of game habitat for generations to come. Leading conservationists throughout the United States are in agreement that certain key types of wildlife habitat must be secured for the generations of sportsmen to come.

There is an immediate need now in Louisiana for this type of land acquisition. The acreage acquired outright by the Commission marked the start of a vital program that will continue as funds for such purposes are available.

It would be well to point out that this tract was purchased at a price of slightly less than $30 an acre. Some states, such as California, have paid as much as $200 per acre for acquisition of wildlife areas. The voters of New York last year approved a $60,000,000 bond issue to finance a land acquisition program for outdoor recreational purposes.

The major type of timber on the Russell Sage Wildlife Management Area is over-cup oak, bitter pecan, willow and water oak, ash and elm. Game species common to the area include squirrel, rabbit, deer, raccoon, opossum, waterfowl, and a scattering of mink and otter.

The Louisiana Wild Life and Fisheries Commission made an initial deer release on this area in 1956. The deer population has increased substantially since this transplanting program. It is estimated that the area should be ready for public deer hunting within two years of the time of purchase.

Approximately 1,000 acres of the tract lies in Wham Brake, which is considered fine waterfowl hunting acreage. Details of planned developments in the area to benefit waterfowl are being formulated by the Fish and Game Division.

The Fish and Game Division is charged with the responsibility of implementing and carrying out research relative to the development of sound management principles on all our game species. This division is called upon to formulate recommendations for annual hunting seasons and regulations. Another responsibility of the Fish and Game Division is the management, maintenance, and continued development of the State's wildlife management areas and public shooting grounds. It should be noted that the land involved totals well over five hundred thousand acres.

It is appropriate, at this time, to mention that our Enforcement Division deserves praise for its efforts. Judged by any standard of comparison, this division has carried out greatly increased duties without faltering at any level.

By increased duties, I have in mind the boating safety law and registration of thousands of boats which went into full effect during the past two years. Enforcement of the boating safety law called for a well-manned, equipped and trained section within the Enforcement Division.

Proof of the division's ability to meet increased duty and perform well can easily be seen in the decline in boating accidents and fatalities last year. This marked decline came about even though boating reached an all-time peak.

One of the first acts of the Commission was to place Wildlife Agents in uniform. This has served a two-fold purpose. Our agents are now readily identified by the general public. This has a psychological impact on the public by giving a dignified appearance to the fast-moving, always alert agents. I feel that uniformed agents are more self-confident. This is important to any law officer who performs a difficult task.

It has also served to create better public relations and public education. Repeatedly, sportsmen and other individuals seek information from the wildlife agents. Their knowledge of projects and programs of the Commission, game laws, and availability of productive hunting and fishing areas—all have contributed greatly to the high caliber, state-wide performance of each and every member of the Enforcement Division.

Administration of the Louisiana Wild Life and Fisheries Commission is often beset with problems. This has become increasingly more pronounced with the task of making industrial uses of wildlife and fisheries resources compatible with sporting uses.

To cite two examples, I would like to touch lightly upon the shrimp and fur industries. In 1961, Louisiana had a very bad year as far as shrimp production is concerned. Probably less than half of the normal shrimp production was realized.

In this particular industry, the condition was not a localized situation. Other states also reported sharp decreases in shrimp production. Such a body blow to a most important segment of the Louisiana fisheries industry, coupled with similar conditions in other shrimp producing states, clearly indicates intensified research is necessary. Projects such as the Commission's shrimp-staining program and repeated samplings are in order. We are grateful that the Marine Laboratory at Grand Terre is one of the finest in the world. Answers to some of the questions that have come up may be supplied through research.

To demonstrate the importance of this work, it is in order to point out that the Louisiana Wild Life and Fisheries Commission is trustee of Louisiana's vast seafood resources. The State's commercial fisheries industry represents an estimated outlay in equipment of 85 million dollars, and directly employs more than 37 thousand people. The overall picture embracing allied industries connected with commercial fisheries operations shows a value of approximately 266 million dollars invested in equipment alone. The figure is steadily growing. The total number of persons associated directly or indirectly with the industry is well over 300 thousand persons.

Because one of the most valuable segments of the fisheries industry is the annual shrimp crop, it is only natural that we are concerned and are sparking intensified research into the breeding cycle of shrimp, their life span and migratory patterns.

This seafood industry, so vital to the economic welfare of Louisiana, is supervised by the Oysters, Water Bottoms and Seafood Division. Other activities of this division, too numerous to list here, include direction of the Coastal Waste Control program, supervision of the oyster industry, and all phases of the shell industry. The latter industry includes planting of shells and leasing of oyster beds, and supervision of the multimillion dollar industrial dredging of shells for many purposes, from road building to manufacture of lime and cement.

The Refuge Division is responsible for the management of six areas in the state containing approximately 245,600 acres of land, most of which are in the coastal parishes. This is the largest acreage of marshland under management by any state wild life department in the United States.

The 83,000 acre Rockefeller Wildlife Refuge, in Cameron and Vermilion Parishes, is considered one of the best-managed refuges in the world. Approximately 45,000 acres of marsh have been improved through construction of levees and water control structures. During the last two years, a well-equipped laboratory and headquarters has been completed at Rockefeller Refuge. Through facilities there, a well-trained staff of research biologists are carrying on various phases of marsh research, the purpose being to provide the Commission, as well as other marshland owners, a sound basis for development work, and to evaluate the various refuges in terms of wildlife benefits.

Similarly, improvement work has progressed on the 80,000 acre Marsh Island Wildlife Refuge. Details of the studies being conducted, and the accomplishments on both refuges mentioned along with others, will be found elsewhere in this report.

The Louisiana Wild Life and Fisheries Commission is greatly concerned about what has happened, and is happening, to the state's fur industry. Those in the Fur Division have been in close contact with the Louisiana Department of Commerce and Industry and other people and agencies interested in Louisiana furs and the economic impact of the plight of people engaged in this industry.

In this administrative report which serves as an introduction to detailed information about all of the Commission activities contained in this biennial report, attention should be called to the preservation of our water quality and pollution control.

The change in public attitude toward this sometimes controversial problem became evident during the past two years. Pollution is no longer looked upon as a pet peeve of sport and commercial fishermen. Pollution is now a public problem and the public is becoming deeply concerned. The Commission's Water Pollution Control Division is now beginning to see some of the results of long years of technical surveys, educational efforts to overcome both public and industrial apathy, and bitter defeats in the courts.

This division is staffed by chemists, engineers, biologists, bacteriologists and waste disposal inspectors. The results contained in this biennial report reveal many major accomplishments in this field of endeavor.

Implementation of an emergency early warning between Baton Rouge and New Orleans to safeguard the source of drinking water for over one million people is the first system of its kind in the nation. It will probably be the forerunner of future working systems to be established on major river basins across the entire United States.

To conduct the handling of funds, budgeting of money for Commission-sponsored projects, the handling of license fees and other financial matters, it is necessary to have a highly efficient accounting department. It is my pleasure to report that we have such a staff. Due to the promptness with which purchasing orders are handled, and careful planning by the divisions of the Louisiana Wild Life and Fisheries Commission, I feel certain at the time this report is being prepared for the printer, the Commission was the first State Agency to declare a surplus for the year 1961, and to return that money back into the State treasury.

In conclusion, I would like to report briefly on the Education and Publicity Division. This is the division which maintains contact between the Louisiana Wild Life and Fisheries Commission and the public.

It is no small task to carry out the many demands which are made upon this division. Some of its activities have already been mentioned. I refer to the operation of the Louisiana Wildlife Museum and the activities of the wildlife lecturers.

These are only some of the activities of the Education and Publicity Division. Its staff is responsible for publication of the LOUISIANA CONSERVATIONIST, considered one of the finest state wildlife magazines in the country. There are now over 70,000 persons who are receiving the magazine. Several hundred are added each month. Subscription is by written request; and we know that there are many readers of each magazine recipient. It is no exaggeration to say that our magazine reaches several hundred thousand readers each month.

This division has also published several pieces of promotional literature including "Careers-Commercial Fishing in Louisiana", "Delicacies from Louisiana Waters", and others. As finances permit, additional ones will be issued.

The division also supervises one of the finest wildlife movie film libraries of any state wildlife commission or department. Several hundred different movies are stocked, including a supply of prints of two that were produced for the Louisiana Wild Life and Fisheries Commission during the past two years. These are loaned free of charge to various groups, sportsmen's clubs, garden clubs, church, school and civic organizations throughout the State. They are also used by the division's wildlife lecturers in their work throughout the state.

The division also issues news releases and assists visiting writers or photographers to secure information about Louisiana's fish and wildlife resources.

I would like to point out that I have only touched lightly upon the activities of the Commission's divisions. Within these pages, you will find specific information about every facet of wildlife and fisheries management. The wealth of information contained herein is the result of countless thousands of hours of work—in the field, in laboratories, in district offices and afloat. It is a report of which I am proud. I trust you will consult it often.

Accounting Section

ROY SCHAEFER
Chief Accountant

Index to Accounting and Statistical Reports

Balance Sheet, June 30, 1961........Exhibit 1
Appropriations and Receipts—All funds ....Exhibit 2
Expenditures—All funds ....Exhibit 3
Conservation Fund Receipts ....Exhibit 4
Operating Accounts—Expenditures 1959-60 ....Exhibit 5
Operating Accounts—Expenditures 1960-61 ....Exhibit 6
Operating Accounts—Expenditures 1961-62 Budget........Exhibit 7
Pittman Robertson—Expenditures ....Exhibit 8
Dingell Johnson—Expenditures..Exhibit 9
Rockefeller Refuge—Expenditures ....Exhibit 10
Oyster Seed Ground—Expenditures ....Exhibit 11
Commercial Seafood—Expenditures ....Exhibit 12
Hyacinth Control Expenditures........Exhibit 13
Seismic—Expenditures ....Exhibit 14
Marsh Island Expenditures........Exhibit 15
Building—Expenditures ....Exhibit 16
Other Expenditures ....Exhibit 17
Shrimp production—monthly........Exhibit 18
Shrimp Production—Processed by area ....Exhibit 19
Shrimp Production and tax Collections by area ....Exhibit 20
Shrimp Production & Number of Trawls ....Exhibit 21
Trawl Boats by Parish & State—1960 ....Exhibit 22
Trawl Boats By Parish & State—1961 ....Exhibit 23
Commercial Fish Production........Exhibit 24
Commercial Fishing and Dealers Licenses ....Exhibit 25
Menhaden Production ....Exhibit 26
Number of Hunting Licenses Sold ....Exhibit 27
Number of Fishing Licenses Sold ....Exhibit 28
Fishing Licenses by Parish ....Exhibit 29
Hunting Licenses by Parish ....Exhibit 30
Motorboat Statistical Report........Exhibit 31

ROY B. SCHAEFER

The statements presented cover our operations during the 1959-60 and 1960-61 fiscal years. Also included are our 1961-62 budgets and a balance sheet as of June 30, 1961. We feel that these are the more important reports which are of public interest and present a concise overall picture of all operations. The detailed supporting statements and records for these reports are maintained in our office as prescribed by law and regulations. All records are audited periodically by the State Supervisor of Public Funds, the State Division of Administration, State Civil Service, and various Federal agencies. Regular reports are also sent to the Supervisory agencies of our dedicated funds.

July 1, 1960 the Motorboat Registration Law (Act 43) was placed under Commission supervision. Quarterly registration statistical reports are

ROGER HUNTER
Supervisor of Revenue

submitted to U.S. Coast Guard Headquarters, Washington D.C. and copies of all accident reports are given to Eighth U.S. Coast Guard district headquarters here in New Orleans. Approximately 50,000 motorboats over 10 H.P. were registered the first year. Our office maintains a complete file of registration and maintains listings by both boat registration number and owner. For ready reference, list copies are furnished State Police Headquarters, Baton Rouge; U.S. Coast Guard Headquarters, New Orleans; and our Wharf located in New Orleans on Lake Pontchartrain.

Our I.B.M. system was installed to efficiently process motorboat registrations and the required records and statistics. The results have been very gratifying in all respects. To fully utilize this equipment we have now adapted our accounting system to I.B.M. It is now possible to obtain valuable information which was virtually impossible to obtain under our prior system. It has been necessary to add only two key punch operators to our permanent staff plus several part time student helpers in peak motorboat application loads.

The statements reveal that $5,739,059 was spent during the 1960-61 fiscal year including payrolls of $2,751,626. Therefore, the $1.00 fishing license is only financing 3% and the $2.00 hunting license only 10% of our total expenses. The national average for a resident fishing license is $2.08 and represents only 2% of the average annual expenditure for fishing. The national average for a resident hunting license is $3.97 and represents only 5% of the average annual expenditure for hunting. If Louisiana is to keep pace with the other states in matters of conservation, we must at least meet the national average license fee which is a pittance compared to the amount spent on these sports.

At present all commercial licenses and receipts, which number approximately 20,000 per year, are being converted to I.B.M. This conversion will enable us to obtain more complete statistical information than our present system. It will also give a better control over delinquent licenses and severance tax receipts. Follow up will be possible within a month after delinquency. The I.B.M. system will also enable us to send license renewal notices by mail instead of relying on voluntary applications and our present license canvass method. Our agents will be furnished parish lists of only those who fail to apply and will be able to concentrate their efforts on license and severance tax violations.

Our five revenue examiners have conducted 634 severance tax audits during the fiscal years 1959-60 and 1960-61. These audits were conducted throughout Louisiana and a few in Mississippi and Texas. The purpose of these audits is to insure proper collection of severance taxes due from various sources. Persons and firms conducting business requiring severance tax payments must keep adequate records of all transactions and make periodic reports with remittances. Our examiners verify their records and remittances. Purchases, production, sales and inventories are reviewed in detail and adjustments are made as required for under or over payments.

The following summary reveals the number of audits within each classification and total revenues accounted for:

Type of Audit	*Number*	*Revenue Amount*
Fur	40	$ 63,028.13
Shell, Fill, Sand & Gravel	128	1,577,734.15
Oyster	144	27,419.70
Shrimp	322	86,063.02
TOTAL	634	$1,754,245.00

Our examiners also verify fishing, hunting and trapping license receipts from each parish. The sheriff in each parish is our agent for these licenses. A clearance or Quietus is issued at the close of each license season after verification. There have been 504 verifications made during this two year period.

IBM Key Punch Operators Rosalie Lemoine and Edson Breun are shown processing motorboat applications.

Exhibit 1

LOUISIANA WILD LIFE AND FISHERIES COMMISSION
BALANCE SHEET

June 30, 1961

ASSETS

	Cash	*Acct. Rec.*	*Total Assets*
General Operating Account	$ 876,333.89	$ 3,911.97	$ 880,245.86
Pittman-Robertson	2,155.25	99,887.10	102,042.35
Dingell-Johnson	9,454.81	15,561.29	25,016.10
Rockefeller Refuge Fund	686,274.71	....	686,274.71
Oyster Seed Ground Fund	354,436.88	....	354,436.88
Commercial Seafood Fund	464,125.44	....	464,125.44
Hyacinth Control	15,687.81	22,974.46	38,662.27
Marsh Island Fund	382,074.87	....	382,074.87
Seismic Fund	419,856.84	26,880.00	446,736.84
Bodcau Game Mgm. Fund	12,309.26	....	12,309.26
Gulf States Marine Fish.	2,055.84	....	2,055.84
Ward McIlhenny Suit	3,763.11	....	3,763.11
Moving of Museum Displays	4,312.46	....	4,312.46
Boat Registration Acct.	152,036.19	....	152,036.19
Wild Life & Fish. Bldg.	18,736.25	75.00	18,811.25
TOTAL	$3,403,613.61	$169,289.82	$3,572,903.43

LIABILITIES

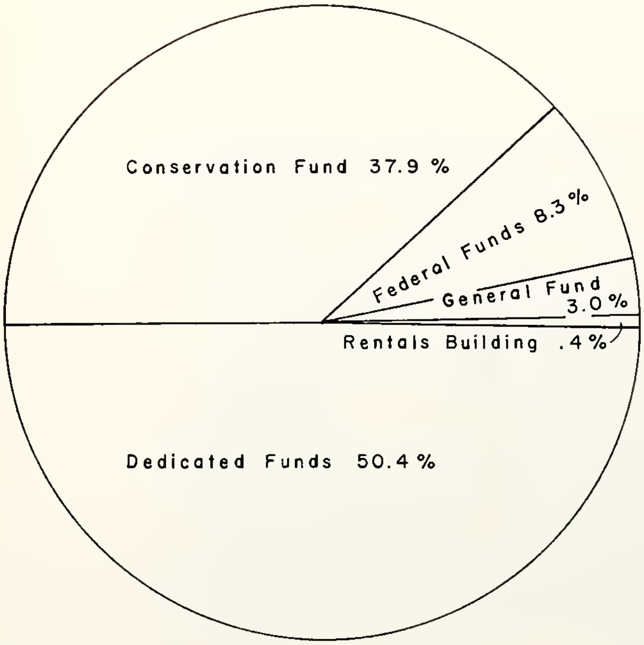
Acct. Pay.	*Conv. Fund*	*Gen. Fund*	*Ded. Fund*	*Total Liab. Res. & Funds*
$ 93,688.41	$ 786,557.45	$........	$..........	$ 880,245.86
8,659.83	93,382.52	....	....	102,042.35
....	25,016.10	....	....	25,016.10
290,307.63	....	....	395,967.08	686,274.71
369.39	....	....	354,067.49	354,436.88
6,244.28	....	....	457,881.16	464,125.44
651.36	....	38,010.91	....	38,662.27
23,507.06	....	....	358,567.81	382,074.87
1,755.00	....	....	444,981.84	446,736.84
....	....	....	12,309.26	12,309.26
....	2,055.84	....	....	2,055.84
3,763.11	....	....	....	3,763.11
4,312.46	....	....	....	4,312.46
949.89	151,086.30	....	....	152,036.19
1,002.93	....	17,808.32	....	18,811.25
$435,211.35	$1,058,098.21	$55,819.23	$2,023,774.64	$3,572,903.43

Exhibit 2

APPROPRIATIONS AND RECEIPTS—ALL FUNDS

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget & Estimated*
Conservation Fund:			
General Operations	$2,024,558.00	$2,273,273.00	$2,287,804.00
Pittman-Robertson & Dingell-Johnson	125,000.00	125,000.00	125,000.00
Hyacinth Control	250,000.00	....	....
Gulf States Marine Fisheries	....	7,500.00	....
Federal Funds:			
Pittman-Robertson	328,174.51	307,209.40	308,335.00
Dingell-Johnson	46,682.32	54,279.61	66,665.00
Hyacinth Control	109,800.00	89,000.00	58,688.00
Water Pollution	40,922.00	40,199.00	40,000.00
General Funds:			
Building Account	112,587.00	100,000.00	105,000.00
Hyacinth Control	....	250,000.00	244,986.00
Marsh Island	....	75,000.00	....
Gulf States Marine Fisheries	7,500.00	....	....
McIlhenny Suit	50,000.00	45,000.00	25,000.00
Research in Crawfish Industry	10,000.00	....	....
Moving of Museum Displays	20,000.00	....	....
Boat Registration	....	254,875.75	....
Rentals:			
Wild Life & Fisheries Bldg.	20,905.70	16,861.55	17,000.00
Dedicated Funds:			
Rockefeller	831,567.42	994,400.29	1,146,240.00
Marsh Island	1,077,169.68	7,422.73	....
Seismic Account	467,959.32	398,588.17	375,000.00
Bodcau Game Management	7,226.00	10,805.65	....
Oyster Seed Ground	405,199.06	347,341.19	350,000.00
Commercial Seafood	402,895.14	343,707.27	350,000.00
TOTAL	$6,338,146.15	$5,740,463.61	$5,499,718.00

1959-60



1960-61

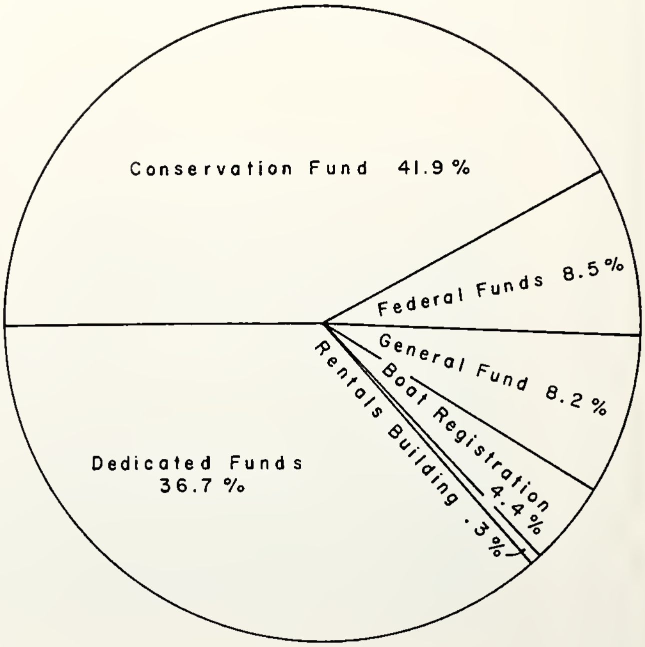
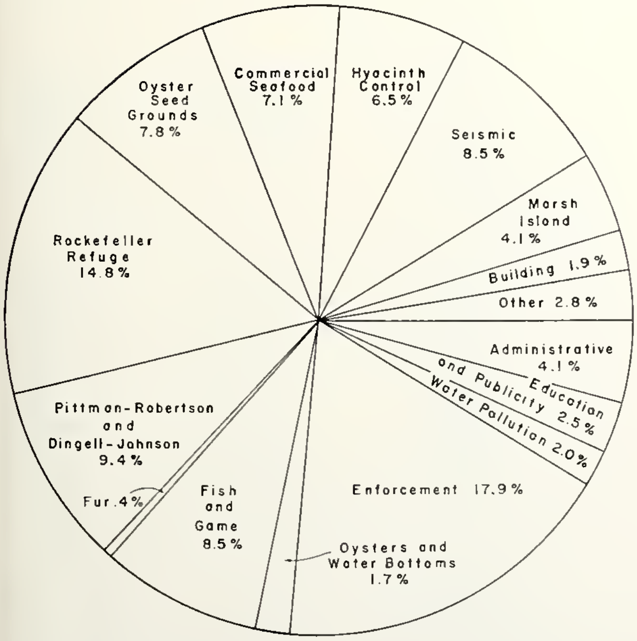


Exhibit 3

EXPENDITURES—ALL FUNDS

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Administrative	$ 215,845.32	$ 292,737.02	$ 372,775.00
Education & Publicity	133,392.75	154,552.07	307,937.00
Water Pollution Control	105,588.78	120,103.26	126,926.00
Enforcement	946,895.21	1,070,023.72	1,295,780.00
Oyster Waterbottom	88,803.60	91,956.72	....
Fish & Game	453,632.71	524,523.84	539,359.00
Fur	21,799.38	23,409.80	26,910.00
Pittman-Robertson	437,566.01	409,612.53	434,979.00
Dingell-Johnson	62,243.09	72,372.81	94,046.00
Rockefeller Refuge	786,345.37	604,086.45	991,577.00
Oyster Seed Grounds	414,500.34	381,854.90	532,960.00
Commercial Seafood	375,949.61	382,679.40	330,823.00
Hyacinth Control	343,819.92	301,074.68	303,674.00
Seismic	450,448.13	386,167.39	424,204.00
Marsh Island	218,150.57	636,620.68	203,653.00
Building	100,416.20	82,191.68	105,000.00
Crawfish Research	8,812.67	....	....
Gulf States Marine	5,556.17	5,444.16	....
Ducks Unlimited	60,000.00	50,000.00	....
Moving of Museum	20,000.00	....	....
Ward McIlhenny Suit	50,000.00	45,000.00	25,000.00
Bodcau Game Management	4,863.64	858.75	....
Boat Registration	....	103,789.45	....
TOTAL	$5,304,629.47	$5,739,059.31	$6,115,603.00

1959-60



1960-61

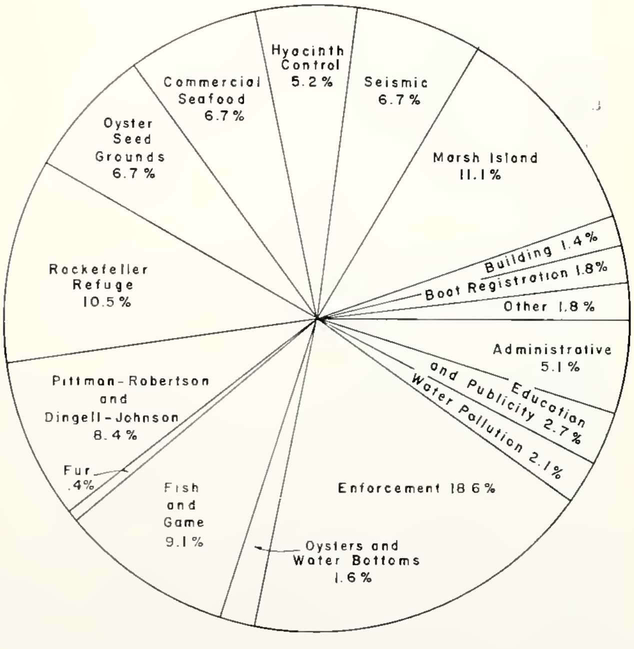


Exhibit 4

CONSERVATION FUND RECEIPTS
ACTUAL RECEIPTS 1959-60 AND 1960-61
ESTIMATED RECEIPTS 1961-62

Type of Revenue	*Actual 1959-60*	*Actual 1960-61*	*1961-62 Estimated*
Sport Licenses:			
Angling—New Orleans	$ 26,246.00	$ 25,303.00	$ 25,000.00
Angling—Other Parishes	184,540.53	214,019.21	215,000.00
Total Angling	$ 210,786.53	$ 239,322.21	$ 240,000.00
Hunting—New Orleans	$ 17,200.75	$ 29,560.00	$ 30,000.00
Hunting—Other Parishes	260,244.60	561,491.42	560,000.00
Total Hunting	$ 277,445.35	$ 591,051.42	$ 590,000.00
Total Sport Licenses	$ 488,231.88	$ 830,373.63	$ 830,000.00
Commercial Fishing & Dealers: (Includes Fish, Shrimp & Oyster)			
Commercial Fisherman	$ 4,245.00	$ 4,915.00	$ 5,000.00
Hoop Net	9,125.00	10,465.00	11,000.00
Fresh Water Seine	2,085.00	2,440.00	2,500.00
Fresh Water Trammel Net	5,970.00	6,395.00	6,500.00
Fresh Water Gill Net	18,960.00	25,740.00	26,000.00
Salt Water Fish & Shrimp Seine	720.00	670.00	700.00
Salt Water Trammel Net	2,040.00	2,205.00	2,300.00
Salt Water Menhaden Seine & Vessel	7,900.00	6,800.00	7,000.00
Oyster Vessel Tonnage	1,231.50	1,548.25	1,600.00
Oyster Dredging	6,900.00	9,700.00	9,700.00
Salt Water Fish Vessel	550.00	510.00	500.00
Salt Water Shrimp Trawl & Vessel	99,180.00	104,155.50	105,000.00
Salt Water Shrimp Freight	75.00	85.00	100.00
Oyster Bedding Ground	58,196.00	65,574.00	66,000.00
Oyster Shop & Resale	1,075.00	1,275.00	1,500.00
Wholesale Dealer	15,700.00	15,700.00	15,700.00
Wholesale Dealer's Agent	650.00	940.00	1,000.00
Retail Dealer	18,165.00	16,905.00	17,000.00
Total Commercial Fishing & Dealers	$ 252,767.50	$ 276,022.75	$ 279,100.00
Severance Tax:			
Gravel	$ 6,421.05	$	$ ....
Sand & Fill Materials	42,715.04	36,945.58	40,000.00
Fur	27,217.53	35,810.60	36,000.00
Oyster	11,865.15	15,554.55	16,000.00
Shrimp	40,923.65	45,139.37	38,000.00
Total Severance Tax	$ 129,142.42	$ 133,450.10	$ 130,000.00
Miscellaneous Licenses & Receipts:			
Hunting Club	$ 1,005.00	$ 1,025.00	$ 1,000.00
Hunting Preserve	800.00	600.00	800.00
Game Breeder	900.00	1,110.00	1,200.00
Oyster Transfer of Lease	38.00	26.00	50.00
Resident Fur Buyer	3,150.00	3,075.00	3,100.00
Resident Fur Dealer	2,850.00	1,950.00	2,100.00
Non-Resident Fur Buyer	100.00	....	100.00
Non-Resident Fur Dealer	1,200.00	900.00	1,200.00
Trapper—New Orleans	386.00	410.00	450.00
Trapper—Other Parishes	6,306.21	6,147.37	6,000.00
Total Miscellaneous Licenses & Receipts	$ 16,735.21	$ 15,243.37	$ 16,000.00
Motorboat Registration	$	$ 254,875.75	$ 100,000.00
Royalties from Mineral Leases:			
Oil & Gas	$ 702,120.35	$1,041,804.89	$1,100,000.00
Sulphur	348,869.65	351,389.74	350,000.00
Total Royalties	$1,050,990.00	$1,393,194.63	$1,450,000.00
TOTAL CONSERVATION FUND RECEIPTS	$1,937,867.01	$2,903,160.23	$2,805,100.00

Exhibit 5

OPERATING ACCOUNTS—EXPENDITURES

1959-60
ACTUAL

	Adm.	*Ed. & Pub.*	*W.P.*	*Enf.*	*Oyster*	*F. & G.*	*Fur*	*Total*
Personal Services	$219,177.86	$ 37,087.31	$ 74,380.43	$ 640,093.11	$55,314.95	232,493.70	$16,815.00	$1,275,362.36
Contractual Services	101,139.50	88,508.49	4,365.66	60,299.91	4,195.45	39,961.15	1,429.20	299,899.36
Travel	13,163.31	925.46	8,465.27	155,542.87	3,147.41	33,881.27	2,126.12	217,251.71
Material & Supplies	55,545.41	5,018.09	10,950.81	48,226.00	15,063.46	60,899.22	1,324.28	197,027.27
Retirement Ins. & Hospitalization	83,128.91	....	....	....	....	....	....	83,128.91
Equipment	8,759.62	1,853.40	7,426.61	42,733.32	1,167.42	46,048.49	104.78	108,093.64
Major Repairs	....	....	....	....	9,914.91	40,348.88	....	50,263.79
Credits	(265,069.29)	....	....	....	....	....	....	(265,069.29)
TOTAL	$215,845.32	$133,392.75	$105,588.78	$ 946,895.21	$88,803.60	$453,632.71	$21,799.38	$1,965,957.75

Exhibit 6

OPERATING ACCOUNTS—EXPENDITURES

1960-61
ACTUAL

	Adm.	*Ed. & Pub.*	*W.P.*	*Enf.*	*Oyster*	*F. & G.*	*Fur*	*Total*
Personal Services	$241,969.66	$ 47,726.32	$ 79,499.43	$ 734,513.50	$58,660.42	$246,537.21	$17,337.50	$1,426,244.04
Contractual Services	111,821.21	95,514.08	4,199.45	55,776.18	6,089.68	55,178.06	2,130.30	330,708.96
Travel	17,428.60	2,272.72	6,906.45	163,214.57	3,362.22	36,139.44	1,664.59	230,988.59
Materials & Supplies	56,114.40	6,310.83	13,353.32	75,633.37	19,966.08	81,974.16	2,277.41	255,629.57
Retirement Ins. & Hospitalization	99,465.74	....	....	....	....	....	....	99,465.74
Equipment	14,490.44	2,728.12	16,144.61	40,886.10	1,942.36	89,578.95	....	165,770.58
Major Repairs	....	....	....	....	1,935.96	396.78	....	2,332.74
Construction	....	....	....	....	....	14,719.24	....	14,719.24
Credits	(248,553.03)	....	....	....	....	....	....	(248,553.03)
TOTAL	$292,737.02	$154,552.07	$120,103.26	$1,070,023.72	$91,956.72	$524,523.84	$23,409.80	$2,277,306.43

Exhibit 7

OPERATING ACCOUNTS—EXPENDITURES

1961-62

BUDGET

	Adm.	*Ed. & Pub.*	*W.P.*	*Enf.*	*F. & G.*	*Fur*	*Total*
Personal Services	$284,080	$108,456	$ 91,562	$ 864,620	$258,209	$22,310	$1,629,237
Contractual Services	97,740	147,280	4,964	68,000	43,000	1,100	362,084
Travel	18,400	8,750	10,000	190,000	45,000	1,500	273,650
Materials & Supplies	52,817	25,178	14,000	104,160	102,500	2,000	300,655
Retirement Ins. & Hosp.	143,138	....	....	....	....	......	143,138
Equipment	11,600	18,273	6,400	54,000	50,650	......	140,923
Major Repairs	....	....	....	15,000	30,000	......	45,000
Construction	....	....	....	....	10,000	......	10,000
Credits	(235,000)	....	....	....	....	......	(235,000)
TOTAL	$372,775	$307,937	$126,926	$1,295,780	$539,359	$26,910	$2,669,687

Exhibit 8

PITTMAN-ROBERTSON—EXPENDITURES

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Personal Services	$209,389.80	$224,546.86	$245,378.00
Contractual Services	51,360.11	53,592.35	50,641.00
Travel	12,677.58	10,638.64	17,759.00
Material & Supplies	72,877.86	75,582.47	73,458.00
Ret.-Hosp.-Ins.	13,794.44	15,530.48	16,390.00
Equip. Purchases	77,466.22	15,302.93	20,132.00
Major Repairs	....	8,168.80	....
Construction	....	6,250.00	....
Contingency	....	....	11,221.00
TOTAL	$437,566.01	$409,612.53	$434,979.00

Exhibit 9

DINGELL-JOHNSON—EXPENDITURES

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Personal Services	$ 39,676.41	$ 44,136.39	$ 47,210.00
Contractual Services	7,698.58	4,380.37	14,104.00
Travel	2,041.73	2,800.84	5,026.00
Material & Supplies	4,865.53	10,261.03	12,578.00
Ret.-Hosp.-Ins.	2,520.28	2,965.71	3,556.00
Equip. Purchases	5,440.56	7,828.47	9,550.00
Major Repairs	....	....	....
Construction	....	....	....
Contingency	....	....	2,022.00
TOTAL	$ 62,243.09	$ 72,372.81	$ 94,046.00

Exhibit 10

ROCKEFELLER REFUGE—EXPENDITURES

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Personal Services	$118,762.14	$155,817.81	$145,753.00
Contractual Services	77,074.06	83,686.44	75,000.00
Travel	3,748.13	7,129.25	5,000.00
Material & Supplies	84,196.53	95,083.38	64,000.00
Ret.-Hosp.-Ins.	8,246.11	10,729.25	11,174.00
Equip. Purchases	136,487.56	129,934.63	112,650.00
Major Repairs	....	49,007.82	148,000.00
Construction	357,830.84	72,697.87	430,000.00
TOTAL	$786,345.37	$604,086.45	$991,577.00

Exhibit 11

OYSTER SEED GROUNDS—EXPENDITURES

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Personal Services	$104,088.27	$105,254.31	$248,582.00
Contractual Services	179,780.79	163,697.26	156,328.00
Travel	13,004.87	12,185.51	17,454.00
Material & Supplies	77,697.69	80,121.41	89,094.00
Ret.-Hosp.-Ins.	6,591.24	6,874.54	10,002.00
Equip. Purchases	33,337.48	10,221.87	11,500.00
Construction	....	3,500.00	....
TOTAL	$414,500.34	$381,854.90	$532,960.00

Exhibit 12

COMMERCIAL SEAFOOD—EXPENDITURES

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Personal Services	$144,300.90	$159,760.42	$132,204.00
Contractual Services	97,184.42	69,074.05	65,495.00
Travel	24,647.47	32,636.90	22,458.00
Material & Supplies	86,419.79	68,316.15	66,234.00
Ret.-Hosp.-Ins.	7,234.13	11,348.72	7,932.00
Equip. Purchases	16,162.90	41,543.16	36,500.00
Major Repairs	....	....	....
Construction	....	....	....
TOTAL	$375,949.61	$382,679.40	$330,823.00

Exhibit 13

HYACINTH CONTROL—EXPENDITURES

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Personal Services	$188,248.51	$196,886.30	$213,555.00
Contractual Services	9,955.59	8,003.14	8,350.00
Travel	8,638.44	17,418.72	9,500.00
Material & Supplies	91,059.70	50,627.91	44,389.00
Ret.-Hosp.-Ins.	10,486.46	12,863.52	15,380.00
Equip. Purchases	35,431.22	15,275.09	12,500.00
Major Repairs	....	....	....
Construction	....	....	....
TOTAL	$343,819.92	$301,074.68	$303,674.00

Exhibit 14

SEISMIC—EXPENDITURES

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Personal Services...	$301,966.71	$260,612.81	$284,274.00
Contractual Services.	3,330.27	3,853.89	4,500.00
Travel	129,334.53	107,910.64	121,134.00
Material & Supplies.	....	....	....
Ret.-Hosp.-Ins.	15,816.62	13,790.05	14,296.00
Equip. Purchases...	....	....	....
Major Repairs	....	....	....
Construction	....	....	....
TOTAL	$450,448.13	$386,167.39	$424,204.00

Exhibit 15

MARSH ISLAND—EXPENDITURES

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Personal Services...	$ 60,631.09	$ 70,255.84	$ 70,112.00
Contractual Services.	45,341.96	37,636.79	38,982.00
Travel	2,505.93	1,988.16	2,206.00
Material & Supplies.	50,569.62	50,705.53	52,077.00
Ret.-Ins.-Hosp.	3,642.62	4,658.21	4,526.00
Equip. Purchases...	29,741.49	442,604.83	30,500.00
Construction	25,717.86	21,190.03	....
Major Repairs	....	3,581.29	5,250.00
TOTAL	$218,150.57	$632,620.68	$203.653.00

Exhibit 16

BUILDING—EXPENDITURES

	1959-60 Actual	*1960-61 Actual*	*1961-62 Budget*
Personal Services...	$ 49,144.17	$ 49,433.57	$ 60,595.00
Contractual Services.	11,250.27	14,538.38	22,500.00
Travel	....	....	....
Materials & Supplies.	7,203.02	9,902.01	7,802.00
Ret.-Ins.-Hosp.	1,725.29	2,057.99	3,103.00
Equip. Purchases...	....	1,887.73	2,000.00
Major Repairs	31,093.35	4,372.00	9,000.00
TOTAL	$100,416.20	$ 82,191.68	$105,000.00

Exhibit 17

OTHER EXPENDITURES

Crawfish Research	*Actual 1959-60*	*Actual 1960-61*
Personal Services	$ 6,844.85	$.........
Contractual Services	56.36	....
Travel	394.56	....
Material & Supplies	1,516.90	....
TOTAL	$ 8,812.67	$.........
Gulf States Marine		
Contractual Services	$ 5,000.00	$ 5,000.00
Travel	556.17	444.16
TOTAL	$ 5,556.17	$ 5,444.16
Ducks Unlimited		
Contractual Services	$60,000.00	$ 50,000.00
TOTAL	$60,000.00	$ 50,000.00
Move Museum		
Contractual Services	$16,755.10	$.........
Material & Supplies	3,244.90	....
TOTAL	$20,000.00	$.........
Ward McIlhenny Suit		
Contractual Services	$50,000.00	$ 45,000.00
TOTAL	$50,000.00	$ 45,000.00
Bodcau Game Mgt.		
Personal Services	$........	$ 280.00
Material & Supplies	4,863.64	578.75
TOTAL	$ 4,863.64	$ 858.75
Boat Registration		
Personal Services	$........	$ 29,454.73
Contractual Services	....	6,917.50
Travel	....	5,194.53
Material & Supplies	....	9,058.06
Ret.-Ins.-Hosp.	....	1,035.48
Equipment	....	52,129.15
TOTAL	$........	$103,789.45

Many families live off the marsh and inland waters of the Louisiana coast, with fur bearing animals, crabs, shrimp, fish and turtle as their cash crops.

Exhibit 18

MONTHLY SHRIMP PRODUCTION—
1941-1961

	Six Year Monthly Barrel Average 1941-1946	*Six Year Monthly Barrel Average 1947-1952*	*Seven Year Monthly Barrel Average 1953-1959*	*Monthly Total 1960*	*Monthly Total 1961*
July	29,907	11,847	17,594	17,649	13,237
August	19,603	45,479	30,393	37,141	27,856
September	60,210	47,835	26,936	34,212	25,659
October	66,999	61,076	42,096	44,785	33,589
November	74,775	44,559	36,190	44,781	33,586
December	68,312	34,998	23,139	19,107	14,330
January	52,312	19,048	9,236	13,621	10,216
February	34,691	18,221	4,805	6,835	5,126
March	19,001	13,558	6,768	10,563	7,922
April	12,591	17,552	7,150	9,181	6,886
May	21,958	36,263	19,732	18,775	14,081
June	37,996	28,804	32,227	50,124	37,702
TOTALS ..	498,355	379,240	256,266	306,774	230,190

The Louisiana blue crab is most sought after by many residents of the fabulous Louisiana coastal villages. Note the distinctive lines of the Louisiana pirogue.

Exhibit 19

LOUISIANA SHRIMP PRODUCTION IN BARRELS PROCESSED BY AREA FOR THE PERIOD JULY 1959-JUNE 1961

Area	*Whole*	*Headless*	*Canned*	*Dried*	*Cooked & Peeled*	*Total Barrels*	*Percent*
French Market (New Orleans)....................	17,943	7,904	.....	.....	.....	25,847	4.8
N. O. Area, St. Bernard and Plaquemines Parish......	2,555	22,960	1,472	1,120	.....	28,107	5.3
Jefferson Parish	239	83,037	7,195	1,006	.....	91,477	17.0
Lafourche Parish	780	109,667	2,816	581	.....	113,844	21.2
St. Mary and all other parishes to Texas line........	2,196	122,972	.....	.....	.....	125,168	23.3
Terrebonne Parish	617	76,748	24,829	18,954	16,040	137,188	25.5
La. Shrimp Processed in Other Gulf States	115	.....	15,218	.....	.....	15,333	2.9
TOTAL July 1959 - June 1961 Production	24,445	423,288	51,530	21,661	16,040	536,964	100.0

Exhibit 20

LOUISIANA SHRIMP PRODUCTION IN BARRELS AND TAX COLLECTIONS BY AREA

	Production and Amounts July 1959—June 1960		*Production and Amounts July 1960—June 1961*		*Total Production and Amounts July 1959—June 1961*	
Area	*Barrels*	*Amount*	*Barrels*	*Amount*	*Barrels*	*Amount*
French Market	17,220	$ 2,582.99	8,627	$ 1,294.02	25,847	$ 3,877.01
New Orleans	14,845	2,226.70	13,262	1,989.30	28,107	4,216.00
Jefferson	47,057	7,058.57	44,419	6,662.90	91,476	13,721.47
Golden Meadow	67,008	10,051.20	46,836	7,025.37	113,844	17,076.57
Morgan City	74,650	11,197.45	50,519	7,577.84	125,169	18,775.29
Houma	79,480	11,921.96	57,708	8,656.22	137,188	20,578.18
Mississippi	6,471	3,235.50	8,651	4,325.75	15,122	7,561.25
Other Non-Resident	43	21.50	168	84.00	211	105.50
TOTAL	306,774	$48,295.87	230,190	$37,615.40	536,964	$85,911.27

Exhibit 21

SHRIMP PRODUCTION AND NUMBER OF TRAWLS AND/OR SEINES

Calendar Year	*No. Barrels Shrimp (210 lbs.)*	*No. of Seines*	*No. of Trawls*
1913	50,000	131	....
1914	52,381	131	....
1915	57,143	268	....
1916	85,714	......	....
1917	57,143	......	....
1918	71,429	300	17
1919	76,190	......	....
1920	152,381	97	499
1921	163,012	135	983
1922	109,050	111	699
1923	153,749	128	1,021
1924	150,624	143	905
1925	154,722	180	1,010
1926	123,967	143	692
1927	150,896	120	913
1928	195,303	261	1,454
1929	210,033	125	1,486
1930	197,550	172	1,176
1931	178,815	126	1,131
1932	152,373	66	699
1933	166,058	67	1,045
1934	226,576	107	1,441
1935	252,981	125	1,433
1936	286,749	30	1,920
1937	362,942	35	2,313
1938	363,656	13	1,662
1939	395,050	26	1,621
1940	397,189	5	3,016
1941	554,354	5	3,028
1942	489,173	4	2,380
1943	441,445	4	2,101
1944	544,378	4	1,866
1945	495,994	4	2,373
1946	464,981	4	3,030
1947	365,617	4	3,408
1948	376,605	4	3,200
1949	376,040	4	3,310
1950	361,365	3	2,819
1951	396,980	0	2,248
1952	398,952	0	2,277
1953	437,340	10	3,543
1954	451,647	4	3,442
1955	365,542	5	3,276
1956	318,130	7	3,072
1957	181,061	9	2,419
1958	208,586	9	4,400
1959	254,438	8	4,154
1960	306,774	7	4,896
1961	230,190	8	4,577

Exhibit 21 is a historic record of the shrimp industry in Louisiana from 1913 through 1961. It is evident that the shrimp industry is a very important part of our economic system.

Exhibit 22

1960

NUMBER OF RESIDENT AND NON-RESIDENT TRAWL BOATS BY PARISH AND STATE

Parish	*40 Feet & Under*	*Over 40 Feet*	*Total*
Acadia	52	2	54
Allen	10	1	11
Ascension	1	0	1
Assumption	3	0	3
Calcasieu	429	6	435
Cameron	122	3	125
East Baton Rouge	6	0	6
Evangeline	6	0	6
Iberia	69	5	74
Jefferson	525	65	590
Jefferson Davis	59	1	60
Lafayette	86	0	86
Lafourche	226	123	349
Livingston	2	0	2
Orleans	228	10	238
Plaquemines	340	10	350
St. Bernard	194	9	203
St. Charles	34	1	35
St. James	2	0	2
St. John	11	0	11
St. Landry	19	0	19
St. Martin	9	0	9
St. Mary	128	107	235
St. Tammany	16	2	18
Tangipahoa	18	1	19
Terrebonne	877	124	1,001
Vermilion	267	6	273
Total Louisiana	3,739	476	4,215
State			
Alabama	9	62	71
Florida	2	13	15
Mississippi	98	213	311
Texas	157	127	284
Total Non-Resident	266	415	681
Grand Total	4,005	891	4,896

Exhibit 23

1961

NUMBER OF RESIDENT AND NON-RESIDENT TRAWL BOATS BY PARISH AND STATE

Parish	*40 Feet & Under*	*Over 40 Feet*	*Total*
Acadia	63	1	64
Allen	8	0	1
Ascension	1	0	1
Assumption	4	0	4
Calcasieu	420	4	424
Cameron	126	5	131
East Baton Rouge	9	0	9
Evangeline	5	0	5
Iberia	76	3	79
Jefferson	451	56	507
Jefferson Davis	49	1	50
Lafayette	96	0	96
Lafourche	282	84	366
Livingston	2	0	2
Orleans	196	11	207
Plaquemines	243	12	255
St. Bernard	195	8	203
St. Charles	34	1	35
St. James	7	0	7
St. John	9	0	9
St. Landry	22	0	22
St. Martin	6	0	6
St. Mary	127	106	233
St. Tammany	15	4	19
Tangipahoa	5	1	6
Terrebonne	976	116	1,092
Vermilion	267	2	269
Total Louisiana	3,694	415	4,109
State			
Alabama	12	33	45
Florida	0	2	2
Mississippi	85	202	287
Texas	130	4	134
Total Non-Resident	227	241	468
Grand Total	3,921	656	4,577

Exhibit 24

COMPARATIVE STATEMENT OF FRESH AND SALT WATER COMMERCIAL FISH PRODUCED BY LOUISIANA FISHERMEN— 1959 AND 1960

Fresh Water Fisheries	*1959 Pounds*	*1960 Pounds*
Catfish	7,096,398	7,735,866
Gaspergou	1,086,533	870,917
Spoonbill	36,072	33,890
Buffalo	4,103,120	3,499,487
Garfish	1,261,168	901,369
Common Fish	862,955	441,768
Fresh Water Turtles	78,629	23,348
Crayfish	271,907	405,090
Frogs	40,317	17,014
Baby Green Turtles— (546,150-Number, 1959)	10,923	*7,882
TOTAL	14,848,022	13,936,631
Salt Water Fisheries		
Sea Turtles	5,207	3,561
Speckled Trout	546,061	392,411
Red Fish	532,630	459,508
Sheepshead	122,074	102,308
Flounders	117,675	65,263
Red Snappers	290,902	497,836
Pompano	5,655	4,958
Mullet	287,605	296,806
Drum	248,357	240,307
Miscellaneous	171,934	190,586
Hard Shell Crabs	6,345,148	5,438,210
Soft Shell Crabs	41,400	53,537
TOTAL	8,714,648	7,745,291
Total Fresh and Salt Water Fisheries	23,562,670	21,681,922

---

*(394,100-Number, 1960)

Fish production figures presented in Exhibit 24 were obtained in cooperation with U. S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries.

Exhibit 25

COMPARISON OF NUMBER OF COMMERCIAL FISHING AND DEALERS LICENSES SOLD BY CLASS 1960 AND 1961

Class of License	*1960 Number Sold*	*1961 Number Sold*
Commercial Fisherman, Bait Seller	844	1,038
Hoop Net	1,872	2,104
Fresh Water Fish Seine	493	428
Fresh Water Trammel Net	1,238	1,367
Fresh Water Gill Net	4,416	4,851
Salt Water Fish & Shrimp Seine	63	69
Salt Water Trammel Net	175	215
Wholesale Dealer—Fish and Seafood	299	309
Wholesale Dealer's Agent	76	86
Retail Dealer—Fish and Seafood	3,581	3,578
Total	13,057	14,045

The figures given for Fresh Water Seine, Trammel and Gill Net were derived from the number of $5.00 tags issued to obtain a true comparison of these classes. The Hoop Net figures were also obtained by using $5.00 denominations. Fifteen hoop net tags are issued for each $5.00 received for this class. Commercial license sales for 1961 established new high records for most of the classes.

Exhibit 26

LOUISIANA MENHADEN PRODUCTION BY UNITS

One Unit = 666 Pounds (Approximately 1,000 Fish)

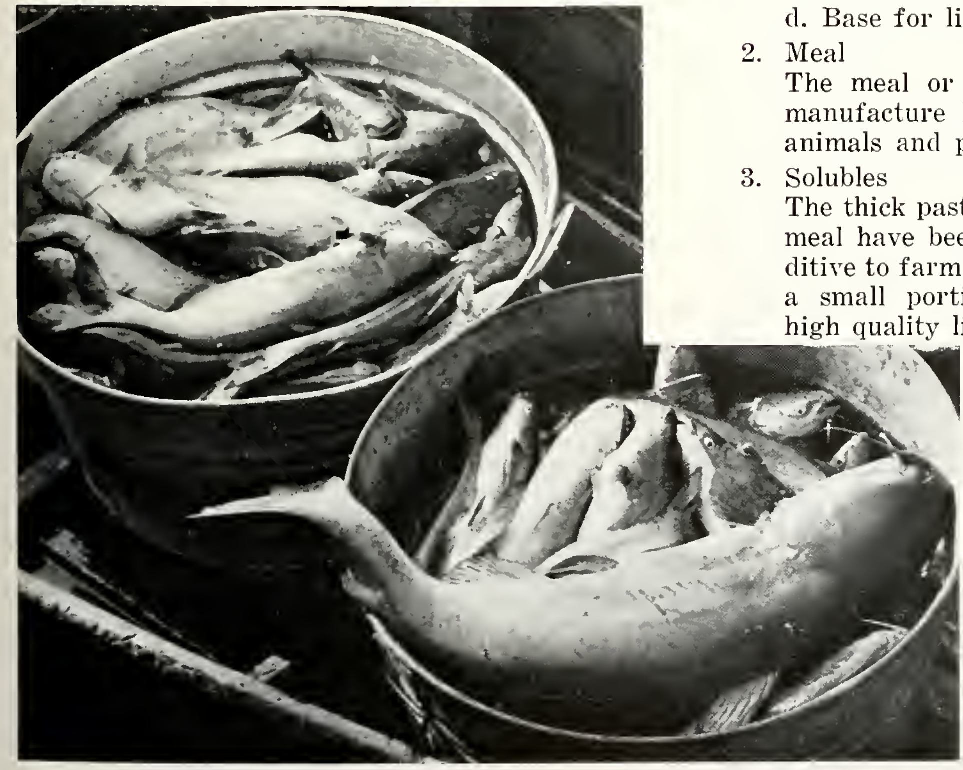
Companies	*6 Year Unit Average 1954-1959*	*1960 Units*	*1961 Units*
Louisiana (Five)	471,431	706,956	847,947
Mississippi (Three)	115,655	166,000	230,000
Texas (Two)	25,713	34,555	39,558
Total Louisiana Production	612,799	907,511	1,117,505

NOTE:

Both the 1960 and 1961 menhaden seasons set new record catches in Louisiana Waters. The prior record year was 1959 with 818,918 units produced. The production figures opposite the Mississippi and Texas Companies show only that portion of their catch made in Louisiana waters. The 1961 catch of over one billion fish is sufficient evidence of the size and importance of this growing industry.

Menhaden oil, meal and solubles have many uses. Some of the more important ones are as follows:

1. Oil
   a. Base for linoleum, paint and soap.
   b. Tempering metals.
   c. Various vitamin compounds.
   d. Base for lipstick and other cosmetics.
2. Meal
   The meal or pulverized scrap is used to manufacture high protein feeds for farm animals and poultry.
3. Solubles
   The thick paste remaining after the oil and meal have been removed is used as an additive to farm animal and poultry feeds and a small portion is used to manufacture high quality liquid plant food.



Louisiana fresh water produces millions of pounds of fish for the commercial fishermen of the state. Here you see tubs of channel catfish, and what could be more tasty than Louisiana catfish and hushpuppies?

Exhibit 27

NUMBER OF HUNTING LICENSES SOLD SEASONS 1939-1940 THROUGH 1960-1961

Season	*Total Licenses*	*Hunting Resident Season*	*Hunting Non-Resident Season*	*Hunting Non-Resident Trip*	*Hunting Big Game*
1939-40	98,167	93,587	1,335	3,245	.....
1940-41	116,653	115,336	166	1,151	.....
1941-42	146,648	144,349	495	1,804	.....
1942-43	119,543	118,300	163	1,080	.....
1943-44	94,609	93,334	181	1,094	.....
1944-45	124,485	121,767	407	2,311	.....
1945-46	162,872	160,795	409	1,681	.....
1946-47	170,396	169,652	744	*	.....
1947-48	176,715	175,482	1,233	*	.....
1948-49	222,201	221,702	499	*	.....
1949-50	235,447	234,964	483	1,140	.....
1950-51	235,472	234,195	137	1,140	.....
1951-52	235,855	234,177	192	1,486	.....
1952-53	209,665	207,428	169	2,068	.....
1953-54	251,488	248,496	**2,992	....	.....
1954-55	242,456	239,695	**2,761	....	.....
1955-56	246,731	243,756	**2,975	....	.....
1956-57	287,810	284,844	**2,966	....	.....
1957-58	284,279	281,708	**2,571	....	.....
1958-59	275,622	272,756	**2,866	....	.....
1959-60	280,672	278,288	**2,384	....	.....
1960-61	317,087	257,438	528	2,659	***56,462

NOTE:
* No trip licenses issued during these years.
** Non-Resident sold on a reciprocal basis. These licenses include both season and trip.
*** 1960-61 First year Big Game License issued.

Exhibit 28

NUMBER OF FISHING LICENSES SOLD SEASONS 1939 THROUGH 1960-1961

Season	*Total*	*Fishing Resident*	*Fishing Non-Resident*	*Fishing Non-Resident 7-Day Trip*
1939	27,096	12,649	14,447	** ......
1940	31,014	16,140	14,874	** ......
1941	52,695	38,080	*14,615	......
1942	41,661	30,608	*11,053	......
1943	36,112	29,492	3,332	3,288
1944	33,239	25,755	3,743	3,741
1945	35,002	27,000	4,088	3,914
1946	52,909	42,621	5,808	4,480
1947	64,055	59,353	4,702	** ......
1948	66,797	63,657	3,140	** ......
1949	82,942	72,397	5,970	4,575
1950	83,068	72,044	5,872	5,152
1951	89,337	76,516	6,477	6,344
1952	102,715	89,159	6,207	7,349
1953	205,049	178,994	10,087	15,968
1954	217,282	187,832	12,048	17,402
1955	220,835	187,466	13,917	19,452
1956	218,757	186,106	14,817	17,834
1957	188,874	159,664	14,124	15,086
1958	192,290	165,566	13,364	13,360
1959	179,820	155,074	14,736	10,010
1960	153,848	134,231	10,519	9,098
1960-61***	139,899	127,198	4,913	7,788

NOTE:
* Includes both annual and 7-day trip.
** No 7-day trip licenses issued during these years.
*** Licenses issued on fiscal year basis.

These Exhibits are historic records of the number of sport licenses sold from 1939 through 1960-61 for fishing and from the 1939-40 season through the 1960-61 season for hunting.

These figures do not even approach the number of persons in Louisiana who enjoy the abundance of our hunting and fishing grounds. An undeterminable number of resident and non-resident persons alike are excluded from the purchase of these licenses as follows:

1. All resident persons who have reached their sixtieth birthday and have actually resided within the state for two years prior to application, are issued free permanent permits to hunt and fish.
2. All resident and non-resident persons under sixteen years of age are exempt from the purchase of sport licenses.
3. No resident is required to have a fishing license unless a reel or artificial bait is used.

Exhibit 29

LICENSES SOLD BY PARISHES

	1960 FISHING			*1960-61 FISHING*		
PARISH	*Res. $1.00*	*N.R. Trip $2.00*	*Non-Res. $5.00*	*Res. $1.00*	*N.R. Trip $2.00*	*Non-Res. $5.00*
Acadia	1,114	6	3	965	9	0
Allen	1,150	18	11	1,069	19	5
Ascension	1,319	4	1	1,098	8	1
Assumption	227	0	0	222	2	0
Avoyelles	1,434	153	32	1,344	123	4
Beauregard	939	30	31	863	35	20
Bienville	813	122	11	945	74	3
Bossier	2,180	336	70	5,035	233	37
Caddo	11,109	2,022	1,866	11,040	1,336	518
Calcasieu	9,213	411	3,378	10,093	568	1,660
Caldwell	253	11	7	218	8	1
Cameron	570	71	497	496	117	326
Catahoula	440	126	39	291	108	21
Claiborne	600	19	7	563	7	1
Concordia	1,351	726	1,823	984	672	777
DeSoto	582	65	75	512	52	19
E. Baton Rouge	10,037	75	206	8,759	65	66
E. Carroll	397	76	55	332	84	38
E. Feliciana	220	1	4	178	12	0
Evangeline	1,034	65	6	1,248	46	8
Franklin	684	21	7	467	13	0
Grant	972	60	6	992	38	6
Iberia	1,929	15	1	2,458	22	5
Iberville	843	3	3	823	12	1
Jackson	928	40	5	850	30	2
Jefferson	6,694	6	2	7,238	5	5
Jeff. Davis	1,549	15	2	1,392	29	3
Lafayette	2,774	11	9	2,927	24	3
Lafourche	1,642	0	2	1,753	1	2
LaSalle	753	89	33	403	31	3
Lincoln	869	20	7	715	14	2
Livingston	1,881	42	29	1,385	40	27
Madison	450	42	49	282	45	35
Morehouse	2,400	106	89	1,598	100	43
Natchitoches	2,119	1,962	419	2,292	1,765	192
Orleans	19,773	432	242	15,685	262	43
Ouachita	6,018	165	18	4,559	117	22

Exhibit 29—Continued

LICENSES SOLD BY PARISHES—Continued

	1960 FISHING			*1960-61 FISHING*		
PARISH	*Res. $1.00*	*N.R. Trip $2.00*	*Non-Res. $5.00*	*Res. $1.00*	*N.R. Trip $2.00*	*Non-Res. $5.00*
Plaquemines	569	0	0	811	1	2
Pointe Coupee	771	56	11	813	29	4
Rapides	5,053	168	26	6,170	111	16
Red River	255	92	55	320	189	30
Richland	898	30	4	694	27	2
Sabine	552	16	12	413	11	9
St. Bernard	1,279	0	5	1,331	0	2
St. Charles	1,951	4	2	1,724	0	0
St. Helena	124	0	1	85	3	0
St. James	542	0	0	467	0	0
St. John	494	0	3	342	3	0
St. Landry	3,621	54	13	3,201	53	2
St. Martin	1,040	18	3	1,135	10	3
St. Mary	1,549	23	11	1,659	38	3
St. Tammany	3,022	171	378	1,816	118	176
Tangipahoa	2,513	61	63	1,548	45	32
Tensas	394	409	213	318	560	266
Terrebonne	2,053	15	2	3,714	14	3
Union	643	38	102	360	23	84
Vermilion	1,046	11	4	836	8	6
Vernon	865	68	64	1,156	84	41
Washington	1,920	87	390	1,228	59	85
Webster	1,861	159	49	1,752	85	11
W. Baton Rouge	2,579	33	3	2,059	12	2
W. Carroll	408	37	14	278	37	7
W. Feliciana	111	2	2	142	2	4
Winn	858	180	44	752	140	224
TOTAL SOLD	134,231	9,098	10,519	127,198	7,788	4,913
1959 & 1960	155,074	10,010	14,736	134,231	9,098	10,519
Increase Decrease	20,843	912	4,217	7,033	1,310	5,606
% Increase % Decrease	13.4%	9.1%	28.6%	5.2%	14.3%	53.2%

Submitted by: Revenue Section

The fishing license period was changed from a calendar year to a fiscal year basis effective July 1, 1960 to coincide with the other sport licenses. These licenses now expire June 30th each year and a new license is required to fish after that date. Resident women are now required to purchase this license to fish with a reel or artificial bait.

Exhibit 30

LICENSES SOLD BY PARISHES 1960-61

	Hunting				
Parish	*Basic Res. $2.00*	*N. R. Trip $5.00*	*N. R. Season $25.00*	*Big Game $2.00*	*Trapping $2.00*
Acadia	4,363	10	0	152	17
Allen	3,396	67	3	1,570	58
Ascension	2,731	0	0	280	35
Assumption	1,413	0	0	223	66
Avoyelles	4,191	7	3	891	40
Beauregard	2,761	26	7	926	42
Bienville	1,963	5	1	422	13
Bossier	5,091	3	0	1,119	23
Caddo	14,079	47	7	3,193	85
Calcasieu	14,326	659	181	1,726	100
Caldwell	1,524	12	1	891	37
Cameron	1,260	396	34	32	193
Catahoula	1,877	14	2	1,063	12
Claiborne	1,561	5	4	463	11
Concordia	2,993	37	79	1,761	12
DeSoto	2,149	18	10	420	47
E. Baton Rouge	15,733	29	1	2,062	19
E. Carroll	1,547	65	8	871	49
E. Feliciana	1,282	3	0	173	8
Evangeline	3,744	1	0	699	25
Franklin	3,329	22	0	2,127	42
Grant	2,101	11	1	757	25
Iberia	4,449	26	1	305	33
Iberville	2,273	0	0	344	18
Jackson	2,404	3	0	971	36
Jefferson	9,340	2	0	663	53
Jefferson Davis	3,499	69	0	207	121
Lafayette	6,480	51	2	205	9
Lafourche	5,162	1	0	318	99
LaSalle	2,494	22	0	1,029	18
Lincoln	2,378	11	1	792	19
Livingston	3,845	1	0	1,036	66
Madison	1,745	122	33	1,491	68
Morehouse	4,551	40	11	2,108	85
Natchitoches	4,198	20	2	1,286	39
Orleans	12,704	84	21	1,607	192
Ouachita	11,910	62	4	3,545	76
Plaquemines	1,580	60	0	128	99
Pointe Coupee	1,961	0	0	475	18
Rapides	11,299	55	4	2,962	67
Red River	1,062	21	0	331	38
Richland	3,091	18	1	1,731	81
Sabine	2,595	7	2	1,133	25
St. Bernard	1,328	0	0	143	191
St. Charles	2,097	0	0	345	54
St. Helena	705	1	0	105	13
St. James	1,532	0	0	262	45
St. John	988	0	0	121	38
St. Landry	8,464	15	0	1,065	54
St. Martin	2,155	2	0	161	43
St. Mary	4,409	16	0	488	172
St. Tammany	4,564	21	15	411	84
Tangipahoa	5,958	5	1	541	28
Tensas	1,516	76	29	1,300	31
Terrebonne	5,109	5	0	255	220
Union	2,613	31	29	971	32
Vermilion	4,379	272	6	188	116
Vernon	2,968	36	9	1,223	38
Washington	4,473	1	4	553	53
Webster	3,974	5	0	892	62
W. Baton Rouge	1,926	8	0	318	5
W. Carroll	2,480	38	9	1,511	70
W. Feliciana	832	5	0	156	1
Winn	2,534	10	2	965	44
1960-61 Totals	257,438	2,659	528	56,462	3,613
1959-60 Totals	278,288	*2,384		None	3,747
Increase		803			
Decrease	20,850				134
% Increase		33.7%			
% Decrease	7.5%				3.6%

*Reciprocal

Submitted by: Revenue Section

The 1960-61 hunting season was the first requiring a separate license for big game. The resident hunting license was increased from $1.00 to $2.00 and the non-resident license was placed on a straight fee basis instead of a reciprocal basis.

Exhibit 31

REPORT OF CERTIFICATES OF NUMBER ISSUED TO MOTORBOATS

CERTIFICATES OF NUMBER ISSUED DURING PERIOD—JULY 1, 1961-SEPT. 30, 1961

Hull Material	*Under 16 ft.*		*16 to less than 26 ft.*		*26 to less than 40 ft.*		*40-65 ft.*		*Over 65 ft.*		*Total*	
	Inboard	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*
Wood	27	1,682	242	652	123	15	12	1	1	.....	405	2,350
Steel	1	4	7	15	36	11	6	1	1	.....	51	31
Aluminum	.....	488	1	67	2	4	1	1	.....	.....	4	560
Plastic	2	349	13	191	1	1	.....	.....	.....	.....	16	541
Other	1	108	3	42	1	1	.....	.....	.....	.....	5	151
Total	31	2,631	266	967	163	32	19	3	2	.....	481	3,633

STATE CERTIFICATES OF NUMBER CANCELLED AND WITHDRAWN DURING PERIOD

Hull Material	*Under 16 ft.*		*16 to less than 26 ft.*		*26 to less than 40 ft.*		*40-65 ft.*		*Over 65 ft.*		*Total*	
	Inboard	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*
Wood	.....	3	2	4	1	.....	.....	.....	.....	.....	3	7
Steel	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	2	.....
Aluminum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Plastic	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Other	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Total	.....	5	2	4	3	.....	.....	.....	.....	.....	5	9

TOTAL VALID STATE CERTIFICATES OUTSTANDING TO DATE —JULY 1, 1960-SEPT. 30, 1961

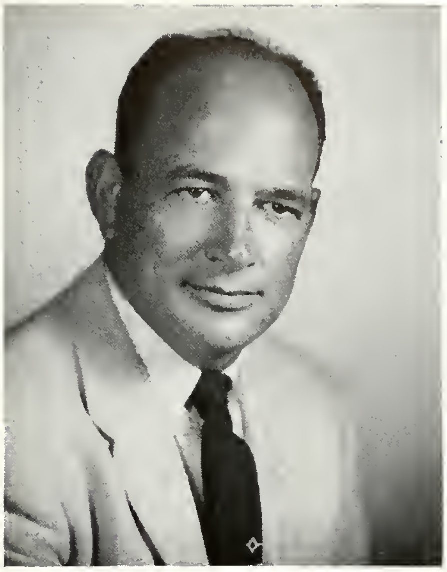
Hull Material	*Under 16 ft.*		*16 to less than 26 ft.*		*26 to less than 40 ft.*		*40-65 ft.*		*Over 65 ft.*		*Total*	
	Inboard	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*	*Inboard*	*Outboard*
Wood	374	19,454	3,747	11,327	3,018	191	259	3	12	.....	7,410	30,975
Steel	59	68	249	147	774	89	77	8	2	.....	1,161	312
Aluminum	21	5,486	30	941	24	23	3	1	.....	.....	78	6,451
Plastic	15	4,057	77	2,282	8	24	1	1	.....	.....	101	6,364
Other	9	1,334	23	660	4	12	2	1	.....	.....	38	2,007
Total	478	30,399	4,126	15,357	3,828	339	342	14	14	.....	8,788	46,109

This statistical report is submitted to the United States Coast Guard Headquarters, Washington D.C. each quarter. The upper portion shows registrations for the quarter reported and the lower portion shows cumulative registrations to date after cancellations have been deducted. Nearly 55,000 motorboat certificates were issued during the first five quarters starting July 1, 1960 and ending September 30, 1961. This does not reflect the number of boats in use in Louisiana because registration is required for only those boats exceeding 10 H.P.

Aviation Section

NELSON SUMMERELL

Flight Supervisor



NELSON SUMMERELL

The functions of the aviation section have been interwoven in the successful expansion of the commission's activities during the past two years.

This section is the network through which the various divisions performed an important part of their respective programs. Expeditious travel, aerial surveys, and patrol flights have not only enabled the divisions to enlarge the scope of their programs, but have also provided the accelerated measure necessary to keep pace with new demands.

The headquarters of the aviation section is the commission's hangar at the New Orleans airport.

The commission's airplanes, two twin-engine amphibious Widgeons, two single-engine Cessnas, and one Super Cub on floats, are flown by commission personnel.

The Flight Supervisor submits monthly reports of the aviation activities to the director of the commission. These reports include a review of the work performed by personnel, the cost of maintenance performed, and the general activities of the section.

Records compiled during the past two years indicate that approximately 15,000 miles were covered by air each month.

Over one-third of the flying time was spent on shrimp and oyster patrols. Two patrols, each

Over one-third of the aviation section's flying time is spent on shrimp and oyster patrols. Three-hour patrols are made twice a day for four months of the year.

This four-place Cessna has proven to be a valuable tool in commission aerial surveys because of its slow speed flight characteristics and maneuverabilities.

Buck Davis and Nat Pedro are commission pilots. Their knowledge of state terrain and waterways have proven to be of valuable assistance in commission functions.

a three-hour flight, are made each day for four months of the year.

Fishermen operating in restricted waters or during closed season were spotted on these aerial patrols and were often apprehended on the scene by a flying agent.

Aerial surveys have proven to be the most feasible way to conduct game and waterfowl census. Aerial surveys have been made bi-weekly during the past two years and have provided valuable information for the management of our state's natural wildlife resources.

The Aviation Section has worked hand in hand with the Enforcement Section. Violations spotted by air are reported by radio to enforcement personnel. Aerial surveillance is maintained until the enforcement agents arrive at the scene. In many instances on-the-spot investigations are conducted by the flying agents themselves.

The Coastal Waste Control personnel utilize the commission aircraft to patrol the industrial units along the coast. Pollution conditions are readily spotted by air. Immediate investigation results in prompt corrections, thus allowing this control unit to keep pollution of state waters at a minimum.

The Aviation Section has played a vital part in the research program of the commission by providing aerial surveys through which the scientists can comprehensively study conditions and formations and by providing efficient and expedient travel when and where it is needed.

The education program of the commission has been supplemented extensively by aerial photography and by the publications made possible by statewide transportation of writers gathering material to promote conservation and utilization of Louisiana's wildlife resources.

The Aviation Section has supplied authorized transportation to television and newspaper personnel to cover disasters, such as hurricanes, floods, and fires, which tend to affect the welfare of the state.

Flying personnel have co-ordinated with the other divisions in assisting in rescue work for disaster areas. Pilots, in commission planes, performed vital rescue work before and after hurricanes Audrey and Carla. Pick-up of persons and valuable wildlife during floods, aiding in the search for lost persons, boats, and crews, searching for vessels overdue at their home ports are some of the rescue services this section has offered during the past two years.

The Aviation Section functions to enable each division to reach further in their specific conservation program.

The commission hangar at the New Orleans airport is the nucleus of aviation activity. All flights originate from this point to various sections of the states to facilitate commission goals.

The Wharf

CLAUDE LeBLANC

Superintendent

CLAUDE LeBLANC

Keeping 300 outboard motors and 300 radios in top shape year round is a job in anybody's language but that's not the only job the "WHARF" with its crew of 22 men and technicians has to do. There's also the care and maintenance of the Commission's fleet of boats, ranging from 62 feet on down with which the WHARF is charged.

Affectionately nicknamed the "WHARF" the Marine and Radio repair department of the Commission, is located at 7612 West End Boulevard on the New Basin Canal. When boats are in need of repair the Wharf's men are on hand to do anything from an adjustment to a major "haul-out."

Usually, when it is more feasible not to return the equipment to the wharf, crews are sent out to effect on-the-spot repairs anywhere in the state. Recently, the wharf has acquired a completely equipped radio repair van which can make statewide repairs. The van will work out of the wharf with radio technician Robert Smothers in charge.

Another addition to the wharf is the new 25-ton stiffleg derrick which will mean that boats up to 50 feet may be lifted for repairs, thus several of the commission's craft, never before serviced in this manner, may be repaired at the wharf.

During the last biennium the wharf completely rebuilt the exploratory vessel "Albacore" and has finished re-building the patrol boat "Pintail".

In the past two years the wharf has to its credit 40 complete overhauls to other craft and the installation or re-building of as many motors not counting outboards.

Besides the three jet-propelled boats recently acquired which are 16 footers and gasoline propelled, which the wharf has in its care, is the new 30-foot turbo-jet cruiser which has a speed capacity of 28 miles per hour.

The craft, which has fascinated the crew at the wharf, has no rudder and absolutely nothing in the way of propellers or any other gadgets on its bottom surface. It is steered by the jet flow from the stern board, which is operated by a finger tip control and can turn on its own length. Its perfectly smooth bottom allows it to operate in very shallow water. Its diesel fuel powering makes for added safety.

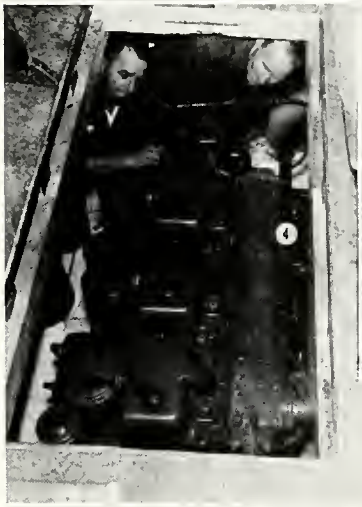
Purchasing for the field such as marine supplies for boats, radios, supplies for camps and the like are handled through the wharf. Communications by means of a fixed radio transmitter with remote control through the main office makes it possible to maintain constant communication with boats, planes and mobile units throughout the State of Louisiana at all times. Besides the outboard motor shop, the marine repair shop and the carpenter shop, the wharf maintains a warehouse for stock parts and materials.

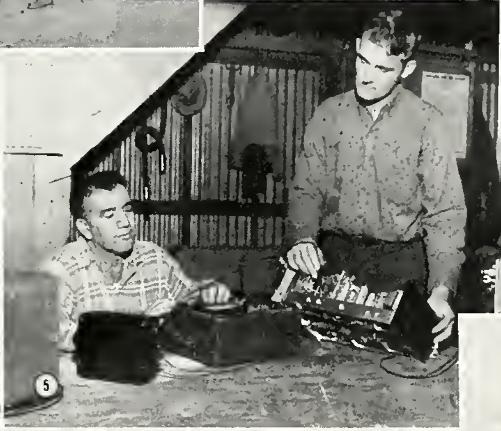
Superintendent of the wharf is Claude LeBlanc who has had many years experience with the commission and, with the U. S. Army before that, in repair, maintenance and "trouble shooting."

1. The wharf's specialists are on hand at all times to make major or minor repairs to the commission's craft. Engine installations are a specialty.

2. The radio repair division at th wharf has recently acquired a mobile repair unit to service the commission's radio equipment.

3. The wharf is getting ready foundations for its recently acquired 25-ton stiffleg derrick which will be able to lift boats up to 50 feet for repairs.





6. Radio technicians at the whar keep the law enforcement division' units and all other radio equippe units in condition thus bringing together all departments of the commission at all times.

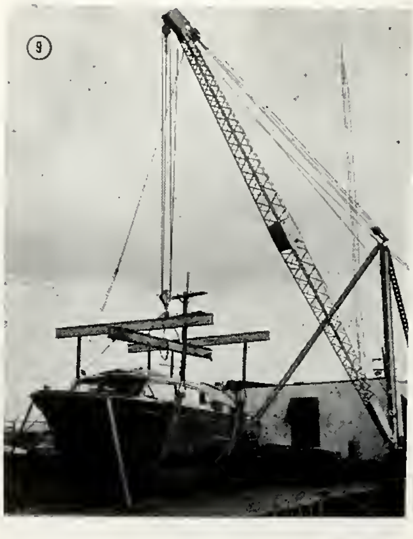
4. Radio specialists at the wharf's radio repair shop service the commission's hundreds of vehicle and boat radios and keep its many walkie-talkies in shape.

5. By means of a fixed radio transmitter, with remote control through the main office, the wharf is able to maintain constant contact with boats, planes and mobile units all over the state at all times.

7. This fast patrol boat has been lifted from the water. It is now ready to be re-floated after a complete overhaul. The wharf averages about 40 of such operations each year.

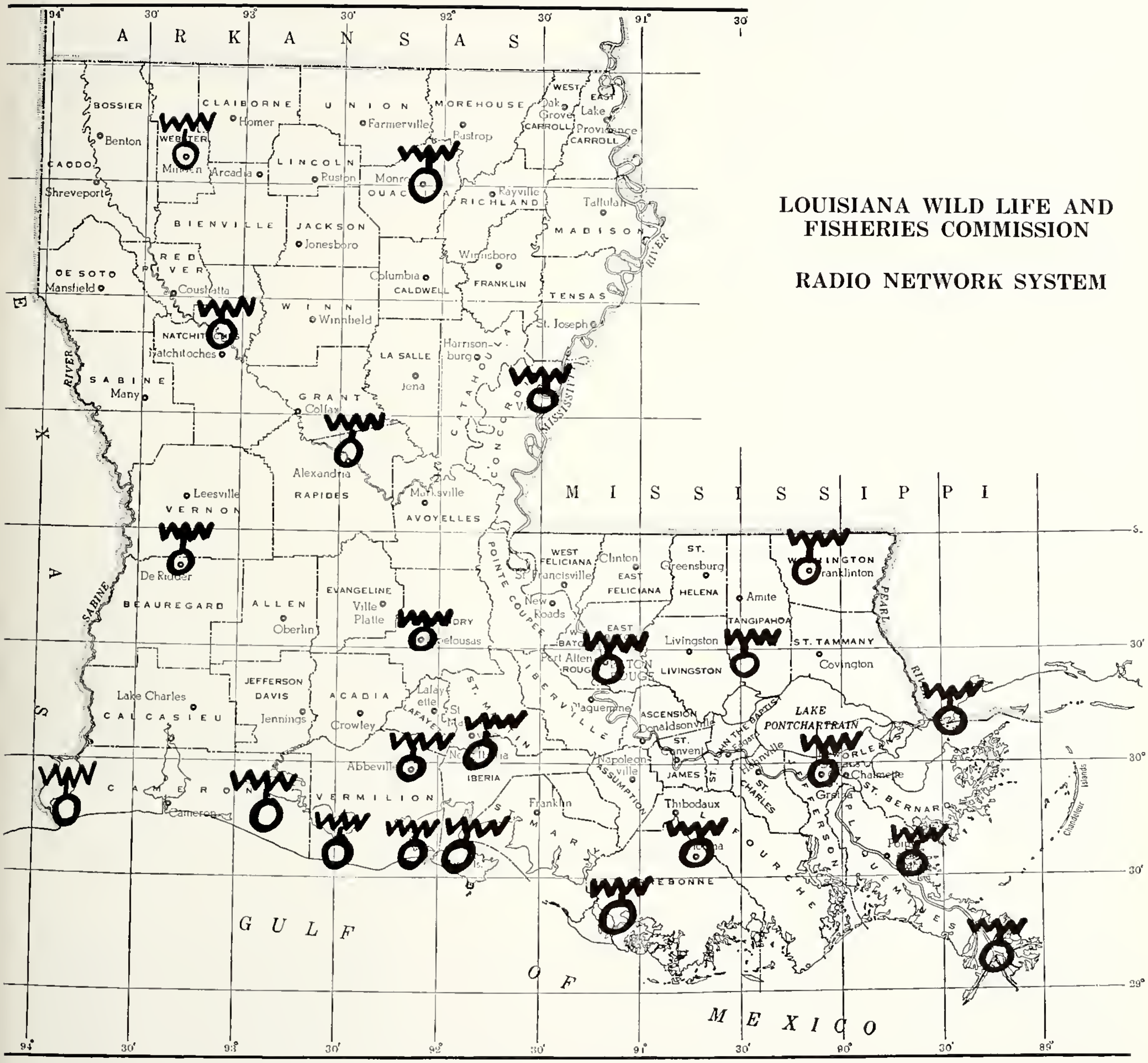
8. This is a general view of the wharf from the New Basin canal in New Orleans where the commission's fleet of boats are serviced for major repairs. Also, the wharf keeps 300 outboards and radios in top shape year round.

9. This is what is called a "haul out" at the wharf. This speedy patrol boat is being completely done over and will be re-launched by this crane in tip-top shape with a minimum of effort.



LOUISIANA WILD LIFE AND FISHERIES COMMISSION

RADIO NETWORK SYSTEM



Information and Education Division

STEVE HARMON
Chief

STEVE HARMON

BECAUSE OF THE increased demand for information concerning Louisiana wildlife by students in schools at all levels the Division of Information and Education has increased its staff and sent instructors out into the field to spread the "Louisiana Wildlife Story."

These instructors, all trained lecturers, are equipped with motion picture projectors, wildlife film, and other visual aid equipment and pamphlets covering many wildlife subjects.

The principal activity of the group is to present their program to the youth of Louisiana; however the instructors also visit service and civic clubs, sportsmen's groups, and other organizations interested in hearing Louisiana's fabulous wildlife story.

Since the inception of the wildlife education program, the division has been deluged with inquires from other similar state agencies as to how it is being operated.

As it is well known, the Division of Information and Education is looked upon as the ultimate source of information concerning the agency's activities, rules, and regulations. These are primarily pointed at the education of the general public as to the importance of the wise use of the state's wildlife resources.

To this end this branch of the agency persistently and by diplomatic methods puts the message of conservation over to the public, making use of every means of communication available to disseminate information. In order to be able to carry out its program the employees of our division have been selected not only for their ability to write the message of the "small voice" of conservation, but also for their backgrounds in public relations. Moreover, our employees must be constantly in touch with every department of the commission in order to present any part of their operations to the public.

We are looked to for "all the answers" for the 365-6 days that make the year by the many and various groups that comprise our complex culture. Consequently we must have the information required on hand. It is to this division that the man on the street, the civic clubs, schools, bureaus and institutions of various kinds, the press, radio, television and visitors to our nationally famous wildlife museum look to for the answers, and sometimes for services above and beyond the line of duty. As the Marines say "the difficult we do today, the impossible we will accomplish tomorrow."

In our present times, when there is a rapid shrinkage of public domain due to the encroachments of a civilization challenged with an explosive population, and the ominous threat of a shortage of the work week hours, individuals are constantly seeking outdoor recreation. This demand continues to grow. The public is thirsting for places to go, to hunt, fish, swim and commune with nature.

As a natural consequence we, as the information dispensers of the commission, are not only looked upon as a general source of such information but are also charged with the supplying of information as to the locations of Louisiana's well-stocked hunting and fishing grounds, hunting seasons, regulations, etc. This adds up to the fact that this division must create good will, through its various mediums of contact, for all the departments of the commission. These contacts are searched for and developed in many fields by our personnel and each takes a special skill to develop.

This division has always striven to keep in step with the various media for disseminating information. During the past decade television has mushroomed into this picture. We have attempted, successfully, to work with the video people and have added special services for the television medium. Our film library is prepared

JACK BRITT
Staff Photographer

McFADDEN DUFFY
Staff Writer

EDWARD WALDO
Staff Writer

at all times to supply the video people with "short clips" to fit in with their programs. This, too, we feel, promotes better understanding and helps us cover our own program.

We have on our staff, writers who are familiar with the needs of the radio, newspapers, and nationally circulated magazines and publications devoted to fishing, hunting, commercial fishing, and allied industries. It is their assignment to convey our message to the public at large, whenever possible. To profit by the use of such media, this division provides not only written material, but also factual data, brochures, photographs, maps, and motion pictures.

The aforementioned crew of lecturers who are now operating full-time throughout the state are an outcropping of a long-range public relations plan instituted by this division to arouse educators throughout the state as to the importance of conservation education and to prove to them that the youth of our state are not only receptive but also are thirsting for knowledge of nature and the great outdoors.

In September of 1959, the division, with this in mind, instituted pilot conservation education classes on a small scale in two high schools in Lafourche parish, at Golden Meadow High School, and the Larose-Cut Off High School.

The plan was a success, as we knew it would be. We knew this from the hundreds of requests for information which flood our mail weekly from students all over the state. Our problem was to convince the educators that this plan would go over. Philosopher Blase Pascal said some 400-odd years ago that "the best way to win an argument with anyone is to let them convince themselves." Hence the plan was such a success and so enthusiastically accepted that State Superintendent of Schools Shelby Jackson authorized the commission to conduct special wildlife work in all of the state's schools. Our plan was launched—it worked.

Now in putting over our program we knew that the enthusiasm of the students was the key to its success. For this pilot course a special mimeographed text was prepared by Lloyd Guidry, teacher in the Golden Meadow school. In it was included such things as a diagram of a shrimp trawl; descriptions of pink, white and brown shrimp; an explanation of why there was a law making it illegal to take shrimp during certain months of the year. The text was complete with even a glossary of shrimp boat slang. The students literally "ate it up". The two high schools where the pilot courses were presented were ideally chosen settings for the experiments since the students were taught, along with other things about Louisiana wildlife, facts about something that was near and dear to their lives, because the shrimp industry affects the livelihood of practically every resident in their area in some way or other.

Although we have acknowledged this fact on many other occasions we must give credit to its fruition to those who had the foresight to cooperate with us in making this phase of our conservation education program a success over the past biennium. The pilot course, which has made evident the necessity of conservation education in our state, may be accredited to the cooperation of the commission with the Louisiana Shrimp Association, the United States Fish and Wildlife Service and the State Department of Education.

One of the foremost efforts in conservation education is the publication of the LOUISIANA CONSERVATIONIST, a monthly magazine which has an unsolicited and ever-mounting circulation. At present, the total circulation of this magazine, which originated in 1948, is 75,000.

During the two-year period, the magazine has devoted more and more space in explaining the commission's policy and program to the public. It has likewise utilized the services of the commission's biologists in writing articles on scientific matters of interest to its readers. The magazine has gained not only mounting favor statewide, but its articles, feature stories, and editorials have been reprinted by conservation magazines in our sister states, and its prestige ranks with the best in the country.

In addition to publishing the LOUISIANA CONSERVATIONIST, the division must also publish a biennial report to the legislature. This report, in book form, has been made so comprehensive in its content that it is not only used for the enlightenment of the legislators, but is also widely used in the state's schools and libraries as a source of factual data on wildlife and its management.

During this biennium a departmental NEWSLETTER was instituted to keep the employees informed as to the activities and policies of the commission and also the accomplishments of members of the various divisions. The NEWSLETTER is published monthly and is contributed to by a "reporter" from each division augmented by a writer from this division who assembles the material and prepares it for publication.

It is also the day to day responsibility of the division to originate all news releases developing in the commission, all directives from the director and the division heads, as well as special material for outdoor writers, newspaper columnists, and contributors to national magazines which cover the fishing and hunting fields.

EDOUARD MORGAN
Museum Curator

There is an ever-increasing demand from outdoor writers for national magazines for information on Louisiana's world-famous fishing and hunting, and it is through the competent and prompt service given these individuals that the division has been able to bring Louisiana's message before the national reading public and to acquaint sportsmen throughout the country with Louisiana's potentialities for their enjoyment of sports afield and astream.

The Louisiana Wild Life and Fisheries Museum provides a mecca for school children, tourists, scientific writers, and ornithologists.

JOE L. HERRING

Education Section

JOE L. HERRING
Supervisor

Conservation is the science and art of managing and using natural resources for the maximum continuous benefit of mankind. Proper management, protection and utilization all are important as we endeavor to improve and perpetuate Louisiana's wildlife resources. To create among our future leaders a knowledge of wildlife and a demand for its conservation will mean much to the cause of protecting this important resource and should contribute in large measure to enjoyment and appreciation of the wholesome things that come from an acquaintance with wildlife.

It then becomes obvious that the "wildlife story" of Louisiana should be told to our present and future leaders. As a step in attaining this end, the Louisiana Wild Life and Fisheries Commission education program has been established.

Many wildlife, civic and garden clubs plus individuals have worked hard to assist the Louisiana Wild Life and Fisheries Commission in establishing the Educational Program. Other individuals and groups including state and federal agencies have cooperated in seeing the "Wildlife Education" program get underway. The State Department of Education has made available personnel and resources of that department for helpful assistance in many phases of the state-wide undertaking.

The program adopted by the Commission, and finally initiated in December of 1960 called for Wildlife Instructors to visit schools and conduct programs on the economic, social, aesthetic and recreational values of wildlife in our state. This is the primary job of the instructors. Their secondary job is to present programs to various civic organizations, sportsmen's clubs, garden clubs, church groups and the many others that request programs from the Louisiana Wild Life and Fisheries Commission for the purpose of being informed about our most valuable wildlife resources.

Wildlife Instructors are equipped with motion picture and slide projection machines along with film and slides on wildlife. Other visual aid equipment includes preserved specimens of various fishes, latex models of reptiles, plastic birds, boats, and animals for display, Daisy air rifles for teaching gun handling and numerous other materials for use in instruction. Visual aids, especially animals, attract and hold the attention of our youths. Students especially like the program where Instructors bring live specimen. When available, Instructors prefer to show live animals to give students a better understanding of the animal in question.

ALVIN M. CARTER

SAM C. MURRAY

RICHARD D. WALL

RICHARD E. WALKER

JOHN PAUL CULPEPPER

VINCENT J. PIZZOLATA

The question and answer periods, after a lecture, pertaining to Louisiana wildlife resources are always of interest. Interest is so great that the length of programs has been reduced so that longer question and answer periods can be conducted.

Principal objective of the educational program is to present to the youth of Louisiana the full work and activities of the Wild Life and Fisheries Commission so that each student will have a basic understanding of our natural resources and their interrelationships, and the ability to recognize resource-use problems and their possible solutions.

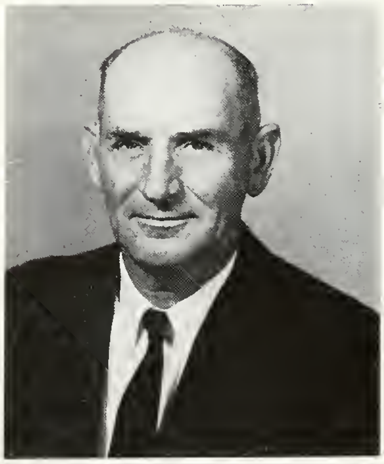
The Wildlife Education program has the primary objective of assisting school teachers, upon request, in supplying both visual and verbal knowledge of Louisiana's vast and important natural resources to their classes. Teachers may secure such wildlife programs by contacting Wildlife Instructors from the Commission's district offices by mail or telephone. These are located in Minden, Monroe, Alexandria, Ferriday, DeRidder, Opelousas, Baton Rouge, and New Orleans.

Personnel of the Education Section went through an indoctrination course of Commission activities. Wildlife Instructors worked with each division of the Commission. Special classes were conducted by Louisiana State University personnel, Louisiana State Department of Agriculture Extension Service personnel, and biologists of the Commission conducted classes on field techniques, to give the instructors first hand information of the vast activities of the Commission. Instructors worked from the Gulf of Mexico north to the Arkansas line, which included most of the state game management areas, wildlife refuges, research areas and fish hatcheries.

By the first week of April 1961 Instructors were in the state schools. The program was well received and when a wildlife lecturer visited one classroom in a school other teachers requested a program. During the summer months of June, July and August Wildlife programs were pre-

VERNON BENNETT

JOE F. TOMME


HARRY GATES

"Birds that Winter in The Forest" was the theme for one display at the Louisiana Forestry Festival in Winnfield, Louisiana.

sented at summer camps including 4-H, church groups, scout and many others. Table I gives a breakdown of meetings and attendance by months.

Table I

Month	*Meetings*	*Attendance*
April 1961	133	6,859
May	180	7,658
June	22	1,479
July	29	2,313
August	26	1,016
September	36	1,567
October	107	4,070
November	171	5,704
December	85	4,455
	789	35,121

The Education Section has given several television and radio programs and participated in many fairs throughout the state. Radio and television programs were on various management phases of our wildlife resources. The fair exhibits or displays told the story of Louisiana wildlife resources. Instructors used live animals when possible along with mounted specimens, charts, maps and many other visual aid materials. Table II gives the number of such programs.

Table II

Type of Program or Display	*No. Programs or Displays*	*No. of Listeners or Viewing Audience*
1. Television	6	651,000
2. Radio	6	91,000
3. Fairs and Festivals	12	201,284
	24	943,284

Other displays not included in Table II were those put up for the 1961 meeting of the Louisiana Wildlife Federation in Monroe, the Louisiana Municipal Association meeting, and numerous store window displays that this section participated in.

The indoctrination course for Wildlife Instructors covered every phase of Commission activities. Here Instructors were observing and assisting Game and Fish personnel in releasing deer on deer research area in District III.

In school, many subjects such as history, civics, geography, math and others may be integrated into a wildlife program. To study geography what could be more interesting than to study the states by waterfowl flyways. History could not have been made without wildlife. Early settlers came seeking furs and buffalo that once roamed Louisiana.

Teaching the wise use of our wildlife resources opens to our students an opportunity for a richer life. Citizens have more leisure time today than ever before and are seeking outlets for this time. Be it hunting, fishing, boating, water skiing, camping, hiking, bird watching or just going to the woods, one may well be a better citizen if he knows how to wisely utilize his time for recreation.

Wildlife management should be taught for the same reason as teaching the many other subjects included in courses of training for our boys and girls. In developing an understanding of the fact that, in improvement of present and future living there is no substitute in science and technology for wise use and care of the earth's present resources.

What do we have here! All look on as Dr. Harry Bennett explains some mysterious life on the Gulf Coast to a group of high school students at Barataria Bay.

For programs pertaining to the research, management, development, recreational and aesthetic values of Louisiana's wildlife resources you may write or contact the District Wildlife Instructor for your area. District offices and parishes of the Louisiana Wild Life and Fisheries Commission are listed below:

District I

Post Office Box 224, Minden, Louisiana
Phone FR 7-3575

Bossier, Bienville, Caddo, Claiborne, DeSoto, Red River and Webster.

District II

Post Office Box 4004 Ouachita Station,
Monroe, Louisiana
Phone FA 5-8266

East Carroll, West Carroll, Morehouse, Union, Lincoln, Ouachita, Richland and Jackson.

District III

Post Office Box 1041, Alexandria, Louisiana
Phone HI 2-1384

Winn, Sabine, Natchitoches, Grant, Rapides and Vernon.

District IV

Post Office Box 426, Ferriday, Louisiana
Phone 757-4571

Madison, Caldwell, Franklin, Tensas, LaSalle, Catahoula and Concordia.

District V

Post Office Box 405, DeRidder, Louisiana
Phone 6111

Beauregard, Allen, Evangeline, Calcasieu, Jefferson Davis, Acadia, Cameron and Vermilion.

District VI

Post Office Box 585, Opelousas, Louisiana
Phone 942-7848

Avoyelles, Point Coupee, St. Landry, Lafayette, St. Martin, Iberville and West Baton Rouge.

District VII

Baton Rouge, Louisiana
Phone DI 3-2838

West Feliciana, East Feliciana, St. Helena, Tangipahoa, Washington, East Baton Rouge, Livingston, St. Tammany and Ascension.

District VIII

400 Royal Street, New Orleans, Louisiana
Phone 523-1981

Iberia, Assumption, St. James, St. John the Baptist, St. Charles, Jefferson, Orleans, St. Bernard, Plaquemines, Lafourche, Terrebonne and St. Mary.

Programs are furnished in the form of lectures, displays, slides, movies, specimens and other visual-aid methods. Instructors present these programs on the latest research and management of our wildlife resources.

LOUISIANA
WILDLIFE & FISHERIES COMMISSION
LOUISIANA WILDLIFE FEDERATION INC

Human interest and wildlife go hand-in-hand. A fair display depicting wildlife management is never without an audience. Young and old, sportsmen and those who "just love the out-of-doors", all join in to observe activities of the Louisiana Wildlife and Fisheries Commission presented at the Ouachita Valley Fair in West Monroe, Louisiana.

Enforcement Division

RUDOLPH P. EASTERLY
Chief

JULIUS L. BOOK
Assistant Chief

THE SPLENDID RECORD the enforcement division has made for efficiency in law enforcement is due largely to the fact that it is headed by Rudolph P. Easterly, who as Chief, has brought to this department his wealth of knowledge in enforcement work.

Chief Easterly's long background as a former Sheriff of Livingston Parish and Warden of the State Penitentiary has been reflected in the work of the men of the division as has the 33-year background of Assistant Chief, Julius L. Book, who has given that many years of service to the Commission.

Attached to the main office are veteran agents Major Anthony Berni, Major Frank Trocchiano, and agent Al Prechac.

Louisiana's 64 parishes are divided into two sections in the enforcement division set up. The Northern Section is supervised by Dewey L. Farrar, Agent III, and the Southern Section is supervised by Lesma Hebert, Agent III, who both receive their instructions and supervision from the Main Office located at 400 Royal Street in New Orleans.

During the past years the enforcement division has prided itself in being able and equipped to step in and "nip in the bud" rashes of law violations. As for an instance in the case of closed shrimp seasons, or extension of closed seasons recommended by the commission's biologists which often didn't suit the wishes of fishermen and which had been declared by the commission as emergency measures.

In such cases the agents of the enforcement division have been prompt to send out patrols by boat and plane into the areas where the law was being flagrantly violated. Trawls and boats have been confiscated promptly and these rashes of lawlessness stamped out.

The latest incident was the case where oyster pirates, prompted by the demand for Louisiana counter and raw shop oysters because of the scarcity of the bivalves in other oyster producing states, invaded privately leased oyster beds and were selling the oysters out of the state thus violating laws against the purchase and transportation of oysters by non-licensed operators and taking of undersized oysters and sale and traffic of untagged oysters.

RUDOLPH P. EASTERLY

In this instance the enforcement division's men stepped into action and in ten days seized more than 3000 sacks of oysters and confiscated four boats from the oyster pirates and broke up this rash of violations.

Among the many achievements that have drawn local and national attention to the division was its praticipation in a dawn crackdown on federal game law violators in Louisiana in one of the largest enforcement activities in the history of conservation and game law enforcement.

On May 8, 1961, federal and Wild Life and Fisheries Commission Game agents, teamed up with U. S. deputy marshals, and arrested at day-

JULIUS L. BOOK

Veteran enforcement officers of Louisiana Wild Life and Fisheries Commission are shown above. Left to Right: Major Lesma Hebert, Southern Supervisor; Major Dewey Farrar, Northern Supervisor; Major Anthony Berni, Main Office and Records Supervisor, and Major Frank Trocchiano, New Orleans Area Supervisor.

break more than 80 violators in a sweeping series of raids.

The arrests for alleged migratory waterfowl violations, which came under the classification of felonies because they involved illegal possession, transportation and sale of ducks and geese, was part of a five-state clean up.

Other states involved in the simultaneous enforcement drive were Arkansas, Maryland, Virginia, and North Carolina. More than half the violators, engaged in what might be termed a "syndicated operation" of offering migratory waterfowl for sale and supplying exclusive restaurants, were apprehended in Louisiana.

The mass arrests followed a long undercover operation, during which a crack undercover agent for the federal government bought ducks and geese from the persons for whom the warrants of arrest were issued.

To obtain evidence, the undercover agent purchased more than 5,000 ducks and geese, and other game, from or through the assistance of 82 persons in Louisiana, 52 individuals in Arkansas, 15 persons in Maryland, and six each in Virginia and North Carolina.

The combination federal-state enforcement operation was described as being a major accomplishment toward full enforcement of federal

District Supervisors

game laws, and protection of ducks and geese.

Another of the sensational moves by the enforcement division was the arrest of five men who were apprehended and charged with deer and duck hunting after having been taken in a dragnet set by Commission game agents in cooperation with federal agents.

During the operation seven agents surrounded the suspected area and were in touch by walkie talkies with a light plane equipped with pontoons and manned by federal agent Joe Perroux. The light plane pinned down the first of the five men, and Perroux landed on the marsh in about six inches of water and captured the hunter with 40 ducks in his possession. A short time later the cruising plane located the other four of the men of the party, who were attempting to flee the marsh, and radioed their positions by means of walkie talkies to the enforcement division's agents who apprehended the men with 16 ducks.

Later the same party of game agents apprehended five poachers at night on the Delta National Wild Life Refuge who were found to be in possession of three deer they had killed. The men were charged in court and sentenced to prison terms.

During these past two years the law enforcement division has also been concentrating on the illegal sale of game fish. Among the many arrests made the most spectacular was that made by an enforcement division undercover agent who, after weeks of purchasing illegal game fish finally made an agreement that the violator would supply him with 500 pounds of game fish provided the agent would "guarantee to take 500 pounds per week." The undercover agent reported having been placed in contact with five persons from whom the violator would purchase the illegal fish. On one occasion the violator was paid for the fish with a personal check upon which the agent had written "For game fish". The operation resulted in the arrest of the six and the breaking up of the ring. On this occasion Chief Easterly commented, "We, of the enforcement division, are justifiably proud of the conscientious work being done in the field by our enforcement agents. Violators are now fully realizing that illegally taking game from law abiding hunters and fishermen is no longer easy."

Captain Joseph Billiot, left, and Al Prechac of the Enforcement Division are seen checking one of the boatloads of oysters allegedly stolen from state lessees by oyster pirates. In ten days of intensified operations the commission's agents confiscated thousands of sacks of oysters and broke up the ring of poachers.

An important decision in favor of the Enforcement Division came in March, 1961 when the Louisiana supreme court ruled that trawl nets used for taking shrimp during closed season in inside waters are forfeited to the Louisiana Wild Life and Fisheries Commission.

Forfeiture of the nets, in addition to other legal penalties, is prescribed by Louisiana law and the supreme court has upheld the authority of the Louisiana Wild Life and Fisheries Commission to carry out the existing shrimp laws.

The decision of the supreme court resulted from an appeal by the commission of a decision of District Judge Bruce Nunez of Plaquemines and St. Bernard parishes.

Louisiana supreme court justices reversed Judge Nunez's ruling on a case involving seizure of trawling nets by the Wild Life and Fisheries Commission.

The supreme court said Judge Nunez erred in ordering nets returned to a man who pleaded guilty of trawling in inside waters and was fined $500.

The trawl net used in illegal trawling in inside waters of Louisiana cannot be returned to the owners, the supreme court ruled in setting aside a lower court decree to that effect.

Judge Nunez, in the case, had originally sentenced a trawl boat operator to pay $500, or serve 15 days in jail; and forfeit the trawling paraphernalia.

The trawling net was later ordered returned when owners of the net went into his court and presented evidence they were unaware of the alleged illegal operations.

In a decree written by Chief Justice John B. Fournet, the high court held that the trial judge was without the right to order the net restored to the owners.

The high court dismissed appeals in three other similiar cases on the grounds that the fine imposed upon the defendants was less than $300, and that the supreme court, therefore, did not have jurisdiction in those cases.

Director L. D. Young, Jr., said that the case mentioned greatly strengthened the position of the commission to seize equipment involved in violation of state laws.

Young pointed out that seizure of the nets complied with R.S. 56:507 which provides: "Whoever violates any provisions of this Sub-part.... shall be mandatorily fined not less than two hundred dollars nor more than thirty days in jail, or both, for the first offense;....In addition thereto, and in the proceedings, the seines, trawls, other devices or equipment, tackle, etc., used in the violation shall be forfeited by order of the court imposing the fine and sentence to the Louisiana Wild Life and Fisheries Commission for such disposal as in its discretion it may see fit to make." (As amended Acts 1958, No. 53, Sec. 9.)

Young further said that the present laws regarding the taking of shrimp are designed to increase the state's supply of shrimp, and to fully protect them during seasons which have been determined as nursery seasons in inside waters by state biologists.

The Northern Section of the State is divided into seven districts comprising the parishes of Bossier, Webster, DeSoto, Caddo, Bienville, Red River, Claiborne, Union, Lincoln, Jackson, Morehouse, Ouachita, Richland, West Carroll, East Carroll, Madison, Natchitoches, Winn, Sabine, Grant, Vernon, Rapides, Caldwell, Franklin, LaSalle, Catahoula, Tensas, Concordia and Avoyelles.

The Southern Section of the State is divided into eight districts comprising the parishes of Beauregard, Allen, Calcasieu, Jefferson Davis, Cameron, Evangeline, St. Landry, Acadia, Pointe Coupee, West Baton Rouge, Lafayette, St. Martin, Iberville, Ascension, West Feliciana, St. Helena, Livingston, East Baton Rouge, Tangipahoa, Assumption, Iberia, Lafourche, St. Mary, Terrebonne, Vermilion, St. James, St. John, St. Charles, Jefferson, Orleans, St. Bernard, Plaquemines, St. Tammany, and Washington, and East Feliciana.

The State's 64 parishes are further divided into 16 districts. Each district is supervised by an Agent II or District Captain.

Agent III's and Agent II's are provided with Commission automobiles and two-way radios. All of the Agent I's, with the exception of a few, are equipped with two-way radios in their privately owned cars.

The entire law enforcement personnel has once again been supplied with summer and winter uniforms.

Minimum salaries for a Wildlife Agent have been set by Civil Service at $295.00 a month, which enables the state to employ an efficient and capable type worker. In addition to the Chief and Assistant Chief the division now employs four Agent III's, 16 Agent II's, 166 Agent I's, one Investigator, five Boat Captains, one Boat Operator, seven Deckhands, ten Laborer Utilities, one stenographer, and one typist.

Each agent is supplied with a boat, motor and trailer in order to fulfill his expected duties with maximum efficiency. Today the work of the law enforcement agent has greatly expanded from just enforcing the law.

Under our advanced system of law enforcement the Commission's law enforcement men, on and off duty, engage in forestalling violations through a voluntary program of educational work in schools, public relations, and rescue work.

General briefing sessions are constantly being held with the Civil Defense training officers in order that enforcement personnel may be prepared to assist in the event of an emergency.

MOTORBOAT SAFETY PATROL

The Louisiana Legislature in the 1960 session increased the many duties of this division when

Motorboat Safety Patrol

the Motorboat Law, Act 43, was passed. The Enforcement Division was given the task of checking all motorboats operated by motors of more than ten horsepower for registration papers and proper safety devices as precribed by the new law. All watercraft is now required to have certain safety equipment when being operated, thus making it necessary to check all boats.

A special detail of 20 men headed by Billy K. James, Agent II, was equipped with trucks, two-way radios, motors, boats and trailers. It has been assigned the permanent task of enforcing the Motorboat Law. The agents of this detail have been instructed to board any craft and inspect those boats for required safety devices and for proper registration papers. The detail is also charged with the apprehension of any motorboat operator and/or water skiers for intoxication or operation of a craft in a manner that is hazardous to the life or property of others.

The fleet of enforcement patrol boats has been extremely effective in keeping down violations of the commercial fishing laws. The fleet consists of seven patrol boats: the Black Mallard, Tarpon, Zoric, Pintail, Barracuda, Pelican and Safety Craft #193, and each one is stationed in a different area during the closed season. Airplane patrols are made by an enforcement agent, with the aid of the Aviation Section, along with these patrol boats.

Due to this constant patrolling the waters have been cleared of fishing boats in closed season, nets are impounded and illegal catches distributed to charitable institutions, thus keeping violations of this nature at a minimum. In continuing this part of its program the Enforcement Division hopes to put Louisiana back on the road to becoming the nation's leading shrimp producing state.

The results of the Enforcement Division's program can best be determined from the following lists of game and fish violations for the years 1960 and 1961:

VIOLATIONS BY PARISHES

Parish	*1960*	*1961*
Acadia	17	17
Allen	22	34
Ascension	28	37
Assumption	31	42
Avoyelles	92	95
Beauregard	17	28
Bienville	24	18
Bossier	12	25
Caddo	15	25
Calcasieu	39	97
Caldwell	16	15
Cameron	83	54
Catahoula	18	44
Claiborne	1	2
Concordia	45	46
DeSoto	8	12
East Baton Rouge	34	12
East Carroll	12	6
East Feliciana	4	5
Evangeline	70	28
Franklin	11	20
Grant	26	38
Iberia	49	99
Iberville	87	157
Jackson	3	4
Jefferson	49	75
Jefferson Davis	8	30
Lafayette	54	23
Lafourche	117	105
LaSalle	21	42
Lincoln	7	4
Livingston	28	18
Madison	16	16
Morehouse	33	24
Natchitoches	28	57
Orleans	49	74
Ouachita	46	15
Plaquemines	74	76
Pointe Coupee	22	39
Rapides	29	46
Red River	7	5
Richland	33	9
Sabine	11	7
St. Bernard	40	111
St. Charles	27	65
St. Helena	8	0
St. James	30	24
St. John the Baptist	19	30
St. Landry	160	65
St. Martin	98	97
St. Mary	60	65
St. Tammany	101	80
Tangipahoa	47	17
Tensas	56	52
Terrebonne	69	137
Union	7	7
Vermilion	26	41
Vernon	19	11
Washington	30	30
Webster	1	14
West Baton Rouge	23	18
West Carroll	6	4
West Feliciana	2	7
Winn	20	11
	2247	2511

TYPE OF VIOLATION

	1960	*1961*
Angling without license	37	887
Angling without non-resident license	25	59
Commercial fishing without license	43	63
Selling Fish without License	13	12
Electrocution of Fish	65	18

	1960	1961
Hunting Deer, No Tag	33	19
Hunting on Public Road	14	1
Possession of Frogs in Closed Season	7	6
Hunting Frogs in Closed Season	33	32
Hunting Rabbits in Closed Season	25	15
Hunting Turkey in Closed Season	11	16
Hunting and Killing Hen Turkeys	1	4
Hunting Without Non-Resident License	14	3
Hunting Snipe in Closed Season	0	1
Hunting and Killing Grosbec	14	15
Hunting Rails in Closed Season	8	13
Hunting and Killing Cranes	6	3
Hunting Fur-Bearing Animal With Gun	15	5
Hunting from Power Boat	112	4
Hunting and Killing Robins	15	6
Hunting Woodcocks in Closed Season	1	1
Hunting Woodcocks Illegal Hours	0	0
Trapping Without License	2	5
Trapping Out of Season	6	2
Trapping on State Preserve	0	2
Camping on Refuge	0	3
Buying Furs Without License	1	0
Buying Furs Illegally	0	1
Setting Fire on State Park	0	1
Operating Hunting Club With No License	0	0
Operating Hunting Club Illegally	0	0
Fishing Game Fish With Illegal Tackle	107	42
Fishing Commercial Fish With Illegal Tackle	33	42
Fishing With Explosives	4	0
Commercial Fishing in Closed Waters	7	13
Fishing on State Preserves	0	0
Poisoning Fish	0	0
Pollution of Stream	1	0
Blocking Stream	53	28
Trawling Without License	12	15
Trawling Without Permit	2	0
Trawling With Net Over 50 feet	0	0
Trawling in Sanctuary	1	3
Trawling With Double Trawl	29	2
Trawling for Crabs	0	0
Trawling in Closed Waters	80	48
Seining in Closed Waters	3	0
Possession of Undersized Fish	23	20
Possession of Over Limit Game Fish	46	25
Possession of Undersized Shrimp	5	12
Possession of Game Fish for Sale	26	4
Possession of Undersized Crabs	5	2
Hunting Frogs With Illegal Gig	3	4
Possession of Over-Limit Migratory Waterfowl	61	22

	1960	1961
Hunting Migratory Waterfowl Illegal Hours	54	5
Selling Migratory Waterfowl	0	5
Hunting and Killing Over Limit Wood Ducks	7	5
Hunting Migratory Waterfowl in Closed Season	84	29
Hunting Migratory Waterfowl With No Stamp	10	3
Hunting Migratory Waterfowl in Baited Pond	22	0
Hunting on State Preserves	37	24
Hunting Without Licenses	159	65
Hunting With Unplugged Gun	74	26
Hunting at Night	403	282
Hunting Quail in Closed Season	8	4
Hunting Squirrels in Closed Season	176	102
Hunting Doves During Illegal Hours	27	2
Selling Squirrels	2	0
Selling Doves	2	0
Hunting and Killing Doves from Vehicle	7	18
Hunting Doves in Baited Area	22	0
Possession of Over-Limit Doves	5	2
Hunting Doves During Closed Season	26	9
Possession of Songbirds	0	4
Possession of Oysters Without License or Tags	0	13
Possession of Over-Limit Squirrels	5	0
Possession of Over-Limit Rabbits	1	4
Killing Doe Deer	49	15
Possession of Illegal Deer Meat	3	8
Hunting Deer in Closed Season	33	39
Hunting Deer in Closed Parish	7	0
Killing Songbirds	0	1
Trapping Songbirds	2	0
Hunting and Killing White Ibis	0	0
Taking Alligators During Closed Season	13	10
Possessing of Undersized Alligators	6	9
Resisting Arrest	0	3
Failing to Return Permit on Specified Time	0	0
Killing Bear in Closed Season	1	0
Hunting Frogs With Gun	0	17
Illegal Taking of Oysters on Bedding Grounds	0	32
Operating Motorboat in a Reckless Manner	0	17
Operating Motorboat With No Lights	0	2
Operating unregistered Motorboat	0	84
Operating Motorboat With Insufficient Life Saving Device	0	193
	2247	*2511

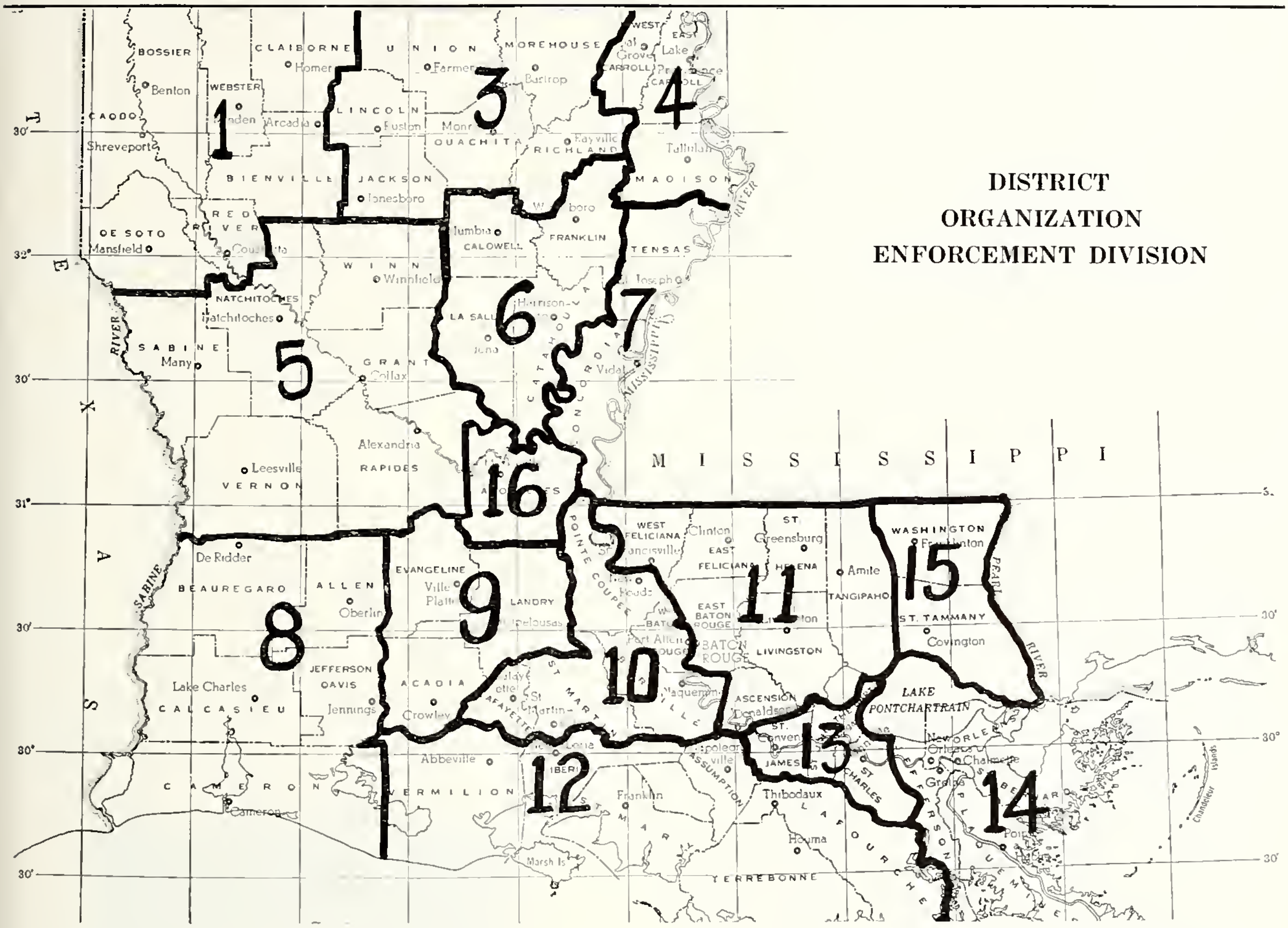
---

*As of 10-31-61.

FINES COLLECTED

The following is a list of total fines collected in District Courts and Federal Courts during the years 1960-1961 for fish and game law violations:

Nolle Prosse	131 cases
Fine Suspended	29 cases
Jail Sentenced	70 cases
Jail Sentence Suspended	32 cases
Case Compromised, Paid Cost of Court	15 cases
Case Dismissed	39 cases
On Probation	67 cases
Minors	40 cases
Not Guilty	11 cases
District Attorney considered Entrapment not by Enforcement Agents but by other people	7 cases
Fines collected in District Courts	$23,127.00
Fines collected in Federal Courts	$12,525.00


DISTRICT
ORGANIZATION
ENFORCEMENT DIVISION

AGENT II's

District No.	*Enforcement Agent*	*Address*
1	Standfield, Edgar L.	510 Lanning St. Box 1025 Minden, La. Tel: FR 7-4333
3	Christian, Harvey	908 Julia St. Box 621 Rayville, La. Tel: 728-2426
4	Parker, James	Box 942 Tallulah, La. Tel: 813
5	Nugent, Earl H.	Route 2 Dry Prong Tel: 3397
6	Peyton, Jesse D.	Box 669 Winnsboro, La. Tel: 435-5480
7	Gillespie, Wm., Jr.	Route 2 Waterproof, La. Tel: 3742
16	Hairford, Jimmie J.	RFD Plaucheville, La.
8	Ellis, James F.	P. O. Box 757 Sulphur, La. Tel: Jackson 7-6768
9	Doucet, Regile, Jr.	Star Route, Box 61 Washington, La. Tel: Gypsy 2-5546
10	Ventrella, Charles	Batchelor, La. Tel: Gypsy 2-5546
11	New, Leonard	P. O. Box 376 Kentwood, La. Tel: 2236
12	Landry, Robert D.	Paradis, La. Tel: Hudson 3-7783
13	Reno, Harry G.	Akers Post Office Manchac, La.
15	Seal, Leroy	Varnado, La. Tel: RE 2-3908

At Large

Billiot Joseph L.	834 Congress St. New Orleans, La. Tel: WH 3-2892
James, Billy K. Captain of Water Safety Patrol	Gardner, La. Tel: SY 3-2278

Fish and Game Division

JOHN D. NEWSOM
Chief

T. B. FORD
Assistant Chief

ACTIVITIES OF THIS Division during the past biennium have been directed toward meeting the needs of the expanding population of hunters and fishermen from the standpoint of increasing recreational opportunities. This has been accomplished through the acquisition of additional lands for management areas, the opening of additional large acreages of land for deer hunting, a continuation of liberal regulations on all resident species insofar as length of season and bag limits are concerned, rehabilitation of fish populations in existing bodies of water through total population removal and selective removal of undesirable species, stocking of new bodies of water and others that have been cleaned out, and a major expansion in the hyacinth control program whereby many streams and lakes throughout the state have been maintained in an accessible condition.

A major effort has been extended by this Division in attempting to obtain more reasonable and equitable regulations on all species of migratory game birds.

T. B. FORD

JOHN D. NEWSOM

During the past biennium a major accomplishment has been made in expansion of the Division general plant. District office buildings have been constructed in Ferriday and Minden; storage buildings have been constructed in Baton Rouge, Ferriday, Alexandria, Minden, and Opelousas, renovations have been made to the Beechwood and Monroe Fish Hatcheries providing for a greater production of fish for stocking purposes and a bio-assay laboratory has been constructed in Monroe for the purpose of determining toxicity of various herbicides and insecticides.

During the past biennium a major effort has been made toward publication of much of the valuable data that has been accumulated during the past years. Among the publications are: (1) a 10 year report on the waterfowl study, (2) a report on a 10 year study of acorn production of all major oaks in the state, (3) a study of Commercial fishing gear, (4) a study of pollution and its effect on aquatic environment, and (5) a study of the ecological factors affecting fish populations of several lakes and streams in the state.

A stable force of adequately trained personnel has been maintained during the past two years and some expansion to the force has been realized.

The present Chief of the Division assumed the duties of the office on March 1, 1960.

Detailed reports on the various activities of this Division follow this general and very brief introduction.

FRED MYERS

AQUATIC VEGETATION CONTROL CO-ORDINATION AND RESEARCH

FRED MYERS
Co-ordinator

VIRGIL T. LAPHAM
Research Biologist

The Aquatic Vegetation Control Program for Louisiana is a combined effort of the State of Louisiana and the U. S. Corps of Engineers. The State of Louisiana furnishes 30 percent of the monies while the Corps of Engineers furnishes 70 percent of the total cost of the combined efforts. For the fiscal year 1961 the total operational budget for the combined federal-state program will be $528,600 of which the State contributes $156,600 and the Federal Government contributes $370,000. The State's operational share is approximately 18 percent over and above their guaranteed participation. The remainder being applied directly to operations by the Corps of Engineers in expanding their normal hyacinth control program in maintaining the navigable waterways in the southern portion of the State. The above money contributed by the State to the program is in the form of work in kind.

The first year's work was performed in areas selected by the Corps of Engineers as "Pilot Operational Areas". After one year's work on these areas as test plots, we arrived at a mutual method of operations. The work being satisfactory to both participants, it was agreed to expand the combined program almost state-wide leaving a few isolated areas to be cleaned by the State money only. The balance of State money from the State's appropriation not being used in the combined federal-state program amounts to approximately $70,000.

The end of the fiscal year 1961 will complete two of the five years set-up by the U. S. Congress for this combined federal-state program. We are proud of the progress accomplished thus far. We have cleaned several streams and lakes in the northern part of the State to an occasional maintenance status, thus permitting us to increase our efforts in other parts of the State.

Although gains continue to be made against hyacinths and more and more of the waters are being phased over into the maintenance program, new problems are arising in these same areas to plague both the workers and the sportsmen.

Alligator weed *(Alternanthera philoxeroides)* is rapidly spreading over the same areas, and although an all out effort has been made by workers in Louisiana, throughout the Southeast, and Federal agencies no satisfactory method of control has been found to date. The Aquatic Vegetation Control Research section has tried over sixty different treatments, using a wide range of chemicals and methods. Some of these show promise but a great deal of further research will be necessary to evaluate the various methods and materials, striving always for some method which will be both effective and economical.

The submerged aquatic plant group composed of coontail *(Ceratophyllum demersum)*, waterweed *(Elodea densa)*, parrot feather *(Myriophyllum brasiliense)*, water milfoil *(Myriophyllum heterophyllum)*, fanwort *(Cabomba caroliniana)*, bladderwort *(Utricularia sp.)* and others present still another problem in control. These plants are not too noticeable until the hyacinth mat is removed and sunlight penetrates into the water. Fertilizers which would produce the algal bloom necessary for their control are prohibitive in cost on all but small ponds, therefore some other means of control must be found.

Pelleted or granular formulations of various herbicides are quite simple to apply and show considerable promise in control of these plants but again a great deal of work will be necessary to establish the right combinations of herbicide, time of application, rate of application, all to be tied in with a cost which will not be prohibitive.

Our work is further complicated by the fact that as these are public waters, no chemical which is toxic to either fish, waterfowl, or animals can be acceptable. All chemicals used in our aquatic vegetation control program are first run through a series of bio-assays at our Monroe laboratory and any material found toxic to fish or other wildlife are ruled out for field application.

In the past the chemical companies have largely concentrated their efforts toward benefiting agricultural crops, but with the continued interest of sportsmen, and the efforts of our and other states' personnel, and the Federal Government, they are slowly becoming aware that an aquatic problem also exists. Several of these companies have now or are in the process of setting up centers aimed at control of aquatic plants. It is hoped that before another biennial report is due that a far more encouraging picture on alligator weed and submerged aquatics will be possible through our joint efforts. Funds and manpower will be necessary to continue our research for better and more economical methods of control which will enable us to keep our waters open for the benefit of our sportsmen and other water users of the state.

J. G. DUTTON

FIELD OPERATIONS

J. G. DUTTON
Field Supervisor

Operating personnel are classified as Hyacinth Control Workers I and II, with a Field Supervisor responsible for the field operations of the program statewide, under the Chief of the Fish and Game Division.

Much research has been conducted in an effort to improve our operations with different types of boats and spraying equipment, but the type used since 1953, the 14 feet aluminum boat, carrying a small rotary spray-pump, has proven itself to be best suited to our needs. This unit is light enough that one man is able to carry it from place to place by truck and yet powerful enough to throw a non-fogging stream of 2,4-D mixture 40 to 50′. Since our spray crews are composed of two men, this characteristic is very desirable in our program because one man can operate it very efficiently when his partner is necessarily absent from the job. It is flexible enough to use in the many close and crowded places where our crews must navigate, making it possible for us to spray the maximum area where water hyacinths are found.

Although the prime objective of this Section is to spray, and thus control the growth of water hyacinths in our better lakes and streams, we have obtained a degree of control of the Lotus, and Alligator weed, although the latter has resisted all effort to kill it.

The truck-mounted 560 gallon tank, with a high pressure pump-spray outfit, is still being used very efficiently where streams are located along highways or other terrain that will support this heavy equipment. We are able to throw a stream of 2,4-D mixture more than one-hundred feet with this equipment which enables us to spray all the side-pits along the airline highway between Kenner and Sorrento, as well as those in the Krotz Springs area and elsewhere. Recently the old truck of 1½ ton capacity was replaced by a new 2½ ton unit which is used for all of our heavy hauling by removing the tank and spray unit. This truck is equipped with a 2,000 pound capacity Anthony Lift Gate, which will easily raise and lower three 55 gallon drums of 2,4-D, each weighing about 600 pounds, thereby removing the possibility of injury to personnel and damage to these heavy drums in this necessary operation. We are able to transport as many as twenty drums of 2,4-D concentrate to all our headquarters, located at sixteen widely separated points over the state.

Another unit recently added in our operations is the tractor-drawn trailer. This unit has a two-fold purpose, (1) the hauling of boats and spray equipment to those lakes and streams that cannot be reached by truck or boat, and (2) the spraying of hyacinths on small pot-holes and sloughs that are too shallow for a boat to navigate and where the surrounding terrain is too soft for a truck to be used. This later operation is accomplished by mounting a spray unit and a 220 gallon tank on the trailer, with personnel walking and using a long hose for spraying.

All the automotive equipment of the Section has been replaced with new units with the exception of two 3/4 ton trucks. We now operate twenty-four automotive units including three station-wagons, twenty trucks and one tractor.

All personnel of the Hyacinth Control Section are constantly on the alert to forestall the killing of growing farm crops and ornamentals. No spraying is ever done in the vicinity of growing cotton because of the high toxicity of 2,4-D for this plant. We are proud of our record of nine years work without one valid claim having been filed against our operations for damage to growing cotton or other farm crops.

The records of the Section are compiled and kept in our office in Baton Rouge, located at the Quail Hatchery Building off Perkins Road. We have a storage warehouse and repair shop in Rosedale where we have two Maintenance Repairmen who are kept busy repairing outboard motors and spray equipment and distributing them and the necessary supplies to our crew headquarters over the state. We have recently built a small warehouse and truck yard at Marksville for storage of equipment and supplies used in Avoyelles Parish. This Parish has the greatest amount of hyacinth-infested waters of any area of the state with the exception of the Atchafalaya Spillway.

Operational crews are located over the state as follows:

Location	*Complement*
Lake Wallace, Caddo Parish	1 Crew
Lake Bistineau, Webster Parish	2½ Crews
Saline Lake, Winn Parish	3 Crews
Spring Bayou, Avoyelles Parish	3½ Crews
DeQuincy, Calcasieu Parish	1 Crew
Crowley, Vermilion Parish	1 Crew
Spanish Lake, Iberia Parish	1 Crew
Martin Lake, Lafayette Parish	1 Crew
Henderson, St. Martin Parish	1 Crew
Pierre Part, Assumption Parish	1 Crew
Bayou Pigeon, Iberville Parish	1 Crew
Rosedale, Iberville Parish	4 Crews
Newellton, Tensas Parish	1 Crew
Bear Island, Livingston Parish	2 Crews
Madisonville, St. Tammany Parish	1 Crew
Slidell, St. Tammany Parish	1 Crew
Miller's Lake, Evangeline Parish	1 Crew

ENGINEERING AND CONSTRUCTION

WILLIAM E. ACKLEN

Engineer

The Engineering Section has the responsibilities of maintaining and keeping in a good state of repair all the building and properties of the Fish and Game Division.

These repairs consist of from minor repairs to major remodeling; for example, the residence at the Beechwood Fish Hatchery has been completely remodeled. This consisted of jacking up and re-leveling the building. The foundation was repaired, the outside was washed, scraped, and repainted, new screens, and a new floor was added to the front porch. The inside was completely remodeled. There was a new finish floor added, which was sanded, filled, and varnished. The walls were altered and rearranged, new storage lockers were added. The walls and ceilings were all lined with sheetrock, which was taped, floated, sanded, and painted, and new trim work was added. The bathroom was completely reworked including new tile wainscoting, new tile floor, and new fixtures. The kitchen was reworked including some new fixtures and a new tile floor.

The Commission purchased 2.54 acres of land located approximately five miles north of Ferriday, fronting on the Waterproof Highway and extending back to Lake Concordia. This land was purchased for the purpose of building an office for the District IV headquarters. In preparing this site for an office location, it consisted of degrading an old, abandoned, protection levee which had approximately ninety foot crown and approximately twelve feet high. This levee was

degraded and distributed over the entire plot of ground. Then there was a road constructed from the highway down to the edge of Lake Concordia. After completion of the grading, an office building was constructed on this site which consists of approximately 1,500 square feet of floor area. The building is patterned after an old colonial style home and it faces the Lake. The building is of frame construction with asbestos siding, asphalt shingle roofing, and asphalt tile flooring. It consists of a large reception room, five private offices, a storage room, a kitchen, and a lounge.

The carpenter crews constructed a new combination storage shed and workshop at the District VII office headquarters. This building consisted of a concrete slab with sheet metal sides and roof. The building was wired for lights and power tools.

New dormitory rooms were added in the old quail hatchery building for the convenience of Commission personnel while stationed at the District VII headquarters or in transit through District VII. Some of the rooms in the old quail hatchery were remodeled for additional work areas for personnel assigned to the District.

The crews built twenty-six permit stations and delivered them to the various game management areas throughout the State. These buildings were 8′ X 10′ in size, and were constructed on skids so they could be easily moved. They consisted of wood floors, one door, and windows, from which to issue permits. They were covered on the sides and roof with sheet metal.

The carpenter crews, also, did some major repairs on the Old Peabody Hall located on the State Capitol grounds. These repairs consisted of rearranging and adding new walls to create private offices and work areas. The building was rewired and additional lighting fixtures were installed. The air-conditioning and heating ducts were extended to the new offices created by changing and rearranging the walls. Additional air-conditioning units were added. The interior of the building was all refinished and repainted. There was accoustical tile added in the Key Punch and Tabulating rooms. New storage shelves and lockers were built.

Some partition walls were rearranged and the inside was repainted in the District II office building located on Sterlington Road four miles north of Monroe. Added to the building was a new constant temperature laboratory and preparation room. This was put on a concrete slab floor with floor drains and plumbing under the slab. The building is of wood frame and is covered with an asphalt shingle roof and is plumbered for hot and cold running water and also with air lines. The building has a central air-conditioning and heating system. There is space provided for approximately 150 aquarium tanks. The preparation room is equipped with a counter area and cabinets with a double sink and an emergency shower. It also has built-in work tables and desks.

There was a tractor storage shed built on the Thistlewaite Game Management Area in District VI. This building is 12′ X 28′ constructed with a concrete floor and corrugated metal sides and roof. There is an 8′ X 12′ storage room which is used for storing materials and supplies used on the Game Management Area. It is wired for electric lights and base receptacle outlets.

There was a storage building built at the District III office headquarters which consists of approximately 1,750 square feet of floor area. This building is partitioned off to form separate storage areas for the different divisions and sections domiciled at the District III office. This building has a concrete floor with corrugated aluminum sides and twin rib aluminum roof. It is wired so as to have electric lights and base plug receptacles in each storage area.

There was a metal storage building built at the District IV headquarters office. This building consists of approximately 2,500 square feet of floor area with concrete floors and corrugated galvanized metal siding with a corrugated aluminum roof. The building is divided by partition walls into various storage areas. It also consists of a large workshop. It is wired so as to have electric lights and base plug receptacles in each storage area and workshop.

The carpenter crews did some major repair work on the guest house and the residence house which is occupied by the Refuge Supervisor on the Red Dirt Game Management Area. The repairs on the residence house consists of putting new accoustical tile throughout the house with new crown molding. There was new wall paneling installed in the living room and new screen doors were installed. The kitchen was remodeled which included tearing out and rebuilding some cabinets, installation of a stove hood and ventilating fan and a new formica top put on the kitchen cabinets.

Repairs to the guest house consists of putting rain gutters on the building, new screens, new formica top on the kitchen cabinets, and repairs to the sewer disposal system.

The carpenter crews constructed a new overnight cabin on the Chicago-Mills Game Management Area. The cabin is of wood frame construction on concrete block piers and chain wall. It has asbestos shingle siding on the exterior with an asphalt shingle roof. The building consists of two large bedrooms, each equipped with large closets with double sliding doors, a hallway, bathroom, lounging room, and a large combination kitchen and dining area.

The interior of the building is finished with sheetrock walls and ceiling which is taped, floated, and painted. The trim work, base boards, doors, and floors were sanded and finished in natural color.

The building is wired with both 110 and 220 volts circuits and is furnished electricity from a rural electrification line.

There was a deep well drilled and equipped with a pressure pump to provide running water into the house.

All plans and specifications are written and all design work is done by the Engineering Section.

The Beechwood Fish Hatchery was also completely remodeled. This consisted of tearing out and replacing some of the main water supply line.

In the hatchery ponds, all the old watering system was torn out and the levees were altered and rearranged. Some of the ponds were made larger and deeper. All of the levees were rebuilt and made wider. A new ring levee and drainage canal was dug to keep the rain runoff water out of the ponds.

An entirely new watering sytsem was installed using cast iron pipe. This was installed in a manner so as to have the least number of fish mortality in removing the young fish from the hatchery ponds for stocking purposes.

The Fish Hatchery located near Black Bayou Lake on the Sterlington Highway north of Monroe has been completely rebuilt. This consisted of removing the islands, leveling the bottom, and building new criss-cross levees in order to create twelve new ponds. All the earth work was done by Commission personnel and equipment. There is a new water filling system, a new draining system, and new draining kettles installed which was done under a contract by a private contracting firm.

The Commission personnel constructed new fish holding tanks. The tanks are approximately 20′ in length, 2′ in width, and 2½′ in depth; built with reinforced concrete. The building is on a concrete slab with the exterior walls constructed of building blocks approximately 3′ above the floor and wood frame for the rest of the building structure. The building is covered with an asphalt shingle roof and the siding is composed of regular drop siding. There are two large door openings; large enough to drive in trucks in order to remove fish conveniently. There are continuous awning type windows built on two sides of the building. The building also has enough space to store the fish hauling truck in one end. There is a separate and complete watering system installed in the building.

The D-7 bulldozer and the American ¾ cubic yard dragline were used on the Soda Lake Game Management Area to do some repair work which consisted of repairing the levees and constructing a new spillway.

The Commission purchased approximately 15,000 acres of land along the Bayou Lafourche drainage canal located in Morehouse, Ouachita, and Richland Parishes which is known as the Russell-Sage Game Management Area. The personnel in the Engineering and Construction Section of the Fish and Game Division constructed an access road to the area on the south side of U. S. Highway 80 approximately 12 miles east of Monroe, Louisiana. This consisted of the installation of two drainage structures and earthen fills over two borrow pits and approximately six foot road fill back to an area where a camp site is to be located. An area approximately two acres in size was cleared and approximately 25,000 cubic yards of fill dirt was hauled and deposited on the area to raise the elevation approximately six feet in height. After the fill was completed, the area was leveled and allowed to settle before the construction of any buildings.

One three-quarter cubic yard dragline and a spud barge is assigned to the Biloxi Public Hunting and Fishing Area, and the Wisner Public Hunting and Fishing Area to build earthen dams and water control structures and other various types of reclamation work in the marsh areas in order to improve the wildlife and migratory waterfowl habitat.

One three-quarter cubic yard dragline is assigned to the uplands of the State of Louisiana mostly in the northern part of the State. It is used primarily for building road fills and cuts on refuges and game management areas. It is also used in building levees and water control structures for impoundments.

There are two bulldozers that are used primarily in clearing and discing land and clearing roads and boundary lines on the various refuges and game management areas. One dozer is primarily used for levees and road work and other cuts and fills on impoundment areas.

DRAFTING

EDDIE BENNETT

Cartographer

Fish and Game Division activities in research, development and management require construction plans, maps and graphs along with the many other necessities. This office is concerned primarily with drafting work, cartography and field survey and has developed from a part-time student aide position to require a full time employee with a student aide. Its services during the past two years include the following:

A preliminary survey was made of Beechwood Fish Hatchery and from the survey a map, subsequent plans and list of materials were completed for the renovation of the ponds and supply and drain lines. Cut and fill stakes were set in each pond for the purpose of reshaping the pond bottoms and in some instances reversing the original drainage system. Lines were established on the site for the alignment of a new supply pipe line. Later along this line cut and grade stakes were set to insure a gravity flow in the supply line.

A group of three deer study areas was surveyed and established on the ground within the Kisatchie National Forest, east of U. S. Highway 167 between Packton and Winnfield. Each area contains 160 acres with an additional 20 acre control area. The boundaries were cleared and staked for the later erection of deer-proof fences. As each boundary was established two lines were carried simultaneously—one line being the actual fence line and the other acting as a reference line in the event the fence line was destroyed. Additional reference points were set occasionally along the lines and at each of the corners. Upon completion of the field work a map was drawn with the boundaries of the areas superimposed on township, range and section lines.

Detailed plans were drawn for several buildings to be constructed throughout the state. These included a new Fish and Game Division District IV office near Ferriday, a new District I office in Minden and an addition to the District II office in Monroe in the form of a fisheries research laboratory.

A waterfowl report being completed this biennium required numerous graphs and maps. These were made in ink line tracing to be etched in plates and reproduced in offset process.

The annual deer season maps were drawn and compiled for publication in brochure form with the outline of hunting seasons and hunting laws.

A new map of Bodcau Wildlife Area has been drawn using the information from the latest available quadrangle maps. Due to the size of the area and scale of the map it is being printed in two parts. The map was made in an ink line tracing and is printed by the offset process. Some of the game management area maps that were printed in 1960 have been redrawn and some have been revised to afford the public hunter the benefit of additional hunting area as well as the latest topographic information on each area.

Plans and specifications were completed for the erection of an entrance sign on the newly acquired Russell Sage Wildlife Area.

Occasionally this office is engaged in projects for divisions other than Fish and Game. During this biennium a floor plan arrangement was devised for the third floor of Peabody Hall near the Capitol building to be used by the Director of the Commission and offices for various divisions. Miscellaneous maps were made from time to time for the Education and Publicity Division. Preliminary planning is now being done for a new dormitory building to be constructed on Grand Terre Island by Oyster, Water Bottoms and Seafood Division.

PREDATOR CONTROL

T. E. HARRIS

Supervisor

The Predator Control section is composed of twelve trappers, and one supervisor. This force has varied in the last two years, due to two retirements, one transfer and several men working on game management projects at various times.

The supervisor and three trappers use state owned vehicles; the others use their own car and are paid seven cents per mile. As the reimbursement for mileage in private vehicles is of necessity limited, the value of each man using his own vehicle is greatly lessened.

This section would be much more efficient if the men were more strategically located over the state.

Much of our work is of most benefit to agriculture. As an example, many of the cotton farmers have invested thousands of dollars in geese for grass control. This would be impossible if this section didn't control the wolf and red fox population, in these areas. We also attempt to control the bobcat population in areas where wild turkeys occur.

The animals that are the greatest detriment to wildlife are dogs chasing deer during the time before and after the fawns are born.

Wolves are very destructive to geese used on cotton farms, pigs, young calves, sheep, goats, watermelons and poultry of various kinds. The foxes are very susceptible to rabies and have caused much concern in the North Central part of the state for the last two years. Another problem is the foxes and deer using the same area, which results in many fox chases, ending with the dogs chasing deer instead.

The following predators were trapped by this section:

1960—Skunks 992, wolves 95, housecats 346, foxes 940, bobcats 243, miscellaneous* 2666.

1961**—Skunks 793, wolves 73, housecats 245, foxes 739, bobcats 136, miscellaneous 1732.

---

*Opossums, raccoons, wild dogs, etc.

**Through November 15th.

River Basin Studies

MAX W. SUMMERS

River Basin Biologist

The future of fish and wildlife resources is dependent on suitable habitat for their growth and reproduction. Native fish and game species require ample food, cover and space for continued high levels of production. The availability of high quality areas is vitally important to the sustenance and maintenance of animal populations at levels which will benefit hunters, fishermen, and trappers all over Louisiana. The preservation of bottomland swamps, coastal marshes and other wetland areas in a natural state holds the answer to continuous yields of all forms of fish and wildlife resources.

The purpose and responsibility of the River Basins Section are to coordinate, investigate, and evaluate all proposed water control projects in Louisiana and determine the total effect these projects exert on fish and wildlife resources. Upon completion of these studies, reports including recommendations are prepared and submitted to all agencies or groups associated with the project. Generally, all projects pertaining to water control have some effect on wildlife. Occasionally small projects of limited scope and in low quality areas have virtually no effect upon fish and game of the region. In other instances various modifications can be incorporated into the project which will offset or delete the damages to fish and wildlife. These project modifications are usually designed to preserve wildlife habitat. Still other projects offer no feasible way of protecting fish and wildlife interests. This is usually the case when rights-of-way and actual construction destroy existing fish and wildlife habitat. Sometimes direct and indirect losses occur through the cumulative effects of the project. This might be experienced over several months or several years depending upon the area and scope of construction operations. When projects are requested by local interests and approved for study by the appropriate authority, regardless of the final outcome, every effort is made to cooperate with the planning agency to minimize fish and wildlife losses. This is accomplished through coordinated measures such as control and disposal of spoil, detailed location and alignment of project, so as to avoid high quality areas, and present or recommend supplementary measures to favor fish and wildlife resources, through preservation of habitat, and incorporating additional features which will favor water quality and maintain natural flows.

There is a particular awareness by conservationists throughout the country of the need for various water control projects to provide for industrial and economic progress. However, we are constantly reminded that previous work of this nature placed little emphasis upon the importance of fish and wildilfe resources and the economic value of these natural assets. The actual fish and wildlife losses attributed to many projects resulted in a decline of recreational benefits by diminishing the previously abundant fish and wildlife populations. Consequently, these valuable resources suffered irreplaceable losses and public enjoyment and utilization was practically nonexistent. We do not mean construction of these projects should have been abandoned, but rather that most of the damages to fish and wildlife resources could have been avoided with proper foresight, planning and combined efforts of the interests involved. It is the opinion of most technically trained conservationists that the most drastic and pronounced change in the ecology of an area occurs as a result of man's effort to occupy previously undersirable or submarginal areas. Similarly these trained conservationists are extremely alarmed by the fact such changes are occuring that will ultimately affect most of the remaining natural environments of our resident fish and game animals. This is not a new problem. It has been present for the past 25 to 30 years but this condition is constantly being aggravated by dwindling wildlife areas and decreased fish and wildlife populations. Now, in the face of increasing recreational demands on hunting and fishing by the expanding population we must insure against further losses of recreational outlets by employing measures necessary to eliminate or reduce the annual destruction these projects do to our important fish and wildlife resources. There is a definite need for a comprehensive multipurpose approach by all interests in solving the problems encountered in all water control projects.

The development of interests and appreciation for fish and wildlife problems by all groups is undoubtedly the most important work which can be performed by the Commission in meeting its responsibilities. It is of the utmost importance to keep all cooperating agencies and interested groups completely informed on all aspects of fish and wildlife requirements and the possible long range effects all water control projects will have on fish and wildlife resources within the project area. In Louisiana almost one-third of its total area is considered as wetlands and the greatest portion of these wetland areas are utilized by fish and wildlife. The preservation of fish and wildlife habitat is essential since all future production of these resources is dependent upon satisfactory environmental conditions. It is not generally recognized that a single water control, navigation, or flood control project constructed in an area can affect large tracts of land, water bodies, and waterbottoms and these effects are depicted by changes in the area's natural ecological character. The plant and animals in the area are directly influenced by changes in their environments brought about by construction aspects of the particular projects. Sudden alteration of an area's ecological regime brings about immediate changes in plant and animal communities which usually result in reduction of habitat capacity and undersirable conditions which over a period of years leads to a partial or complete deterioration of the area's normal production capacity. Fish and wildlife resources are a product of the land, they are dependent upon suitable environmental conditions in order to live, reproduce and sustain their numbers. Without adequate habitat the future production of fish and wildlife forms will be prohibited and those remaining will not be in sufficient numbers to provide sport for the ever increasing number of outdoor enthusiasts. Once a project is built and the damage to wildlife is done the restoration costs are staggering and even if money and time would permit, restoring the affected area to previous production would be impossible. Thus, prevention of damage and destruction to fish and wildlife habitat is the only feasible way to preserve and perpetuate fish and wildlife resources. Whenever a project is approved for construction it should be a purpose of this project to provide enough money to the appropriate agency for the rehabilitation of such lands so these areas will be capable of maintaining their orginal value as fish and wildlife producers.

During the past biennium a continuing shortage of personnel coupled with increasing responsibilities has limited our efforts primarily to the major water control projects. This is not meant to construe that the hundreds of smaller projects were insignificant; to the contrary the cumulative effect of these projects is of prime importance, but physical limitation of personnel as well as a limited budget would not allow complete coverage of these projects. This problem is steadily increasing and the annual losses to fish and wildlife is continuing at an accelerated pace. There is a great need for additional personnel to cover this area of responsibility. Also, increased funds are necessary to implement this program and permit adequate coverage of all segments of water control projects.

The following paragraphs will brieflly summarize the projects studied or continued, as well as describing special categories of work performed by this section during 1960-61.

MISSISSIPPI RIVER GULF OUTLET PROJECT

This project is in the final construction stages and has been described in previous biennial reports. Previous surveys and studies were conducted and necessary management provisions as well as suggested project modifications have been made. The most beneficial effort to protect wildlife of the area was the inclusion of spoil retention dikes along the project alignment. This particular project modification came to be as a result of coordinated efforts between this section and the Branch of River Basins Studies, U. S. Fish and Wildlife Service. The localizing of spoil saved large areas of prime wildlife habitat which lie along the project course. Ponding of the spoil also saved many oyster leases or oyster producing grounds from silting over and complete destruction. As the project progressed there has been additional wildlife coordination work concerning the methods of construction. Various problems have arisen that required further modification measures to protect fish and wildlife interests and chances are there will be additional problems that will necessitate extra work on this project before it is finally completed.

BARATARIA BAY WATERWAY PROJECT

This project was authorized by the Rivers and Harbors Act of 3 July 1958 as a modification of the original project completed in 1925. This project provides for a navigation channel 12 feet in depth below mean low gulf level over a bottom width of 125 feet, from the Intracoastal Waterway to Grand Isle, via Bayous Barataria and Dupont, Dupre Cut, Bayous Cutler and St. Denis, a relocated channel along the western shore of Barataria Bay, and Barataria Pass to the 12-foot-depth contour in the Gulf of Mexico and in the easterly 3.2 miles of Bayou Rigaud. Work on this project began in May of 1960. Work is scheduled to be completed in 1963. This commission supplied the U. S. Army Corps of Engineers with its views relative to fish and wildlife interests at the beginning of the project and since then additional comments and prepared statements have been exchanged with the participating agencies.

OUACHITA RIVER NAVIGATION PROJECT

The Rivers and Harbors Act of 14 July 1960 authorized the modification of the existing 6.5-foot project for Ouachita and Black Rivers, Arkansas and Louisiana to provide for a 9 foot deep and 100 foot wide navigation channel from the mouth of Red River to Camden, Arkansas. This entails the rehabilitation of existing dams, construction of four new locks and dams, dredging and channel improvement.

This project has created a great deal of interest and much controversy which has stemmed from the proposed location of one of the new locks and dams. This particular structure is lock and dam No. 2 to be installed in the neighborhood of Jonesville, Louisiana. According to the Corps of Engineers this lock and dam can either be built above the mouth of Little River at Jonesville or below this site some 25 miles. This section has spent some time reviewing and studying these proposals since the location of this lock and dam below the mouth of Little River will adversely affect Catahoula Lake, one of Louisiana's finest waterfowl and sport fishing areas. A great deal of information has been gathered concerning this area and a report has been submitted concerning the economic value of Catahoula Lake's natural surface resources. An annual value of $4,500,000 was established as the economic benefit Catahoula Lake contributed to this area in the form of hunting, sport fishing, commercial fishing and economic benefit to the agricultural interests of the area. The irreplaceable character of this lake precipitated a resolution by this commission requesting the District

Marsh canalization, such as the Houma Navigational Channel shown above, has drastically altered the estuarine areas of coastal Louisiana.

Engineers, U. S. Corps of Engineers, Vicksburg, Mississippi, to favorably consider the above Jonesville location for lock and dam No. 2 to safeguard Catahoula Lake's natural overflow characteristics and prevent the destruction of this vast natural fish and wildlife area. We believe this, like many other areas affected by water control projects, to be extremely important to the preservation of fish and wildlife resources, and to protect such areas will insure future fish and wildlife populations for the people of Louisiana to utilize and enjoy for years to come.

FRESHWATER BAYOU PROJECT

This project, authorized by Rivers and Harbors Act of 14 July 1960, provides for a new 12 X 125 foot waterway between the Gulf Intracostal waterway in the vicinity of Vermilion River and the Gulf of Mexico. The waterway will generally follow the existing channels of Schooner Bayou Cutoff, Schooner Bayou, Six Mile Canal, Belle Isle canal and Freshwater Bayou. A 56 X 600 X 14 foot lock will be constructed in the vicinity of Beef Ridge near the Gulf to prevent the intrusion of salt water into the marshes. Because this region is an exceptionally high quality waterfowl area and a valuable fur producing region economic studies were conducted to supplement the Commission's views concerning anticipated damage to fish and wildlife resources. Much activity and coordinated effort has been expended to present the recommendation and interest of this agency in order to sustain fish and wildlife benefits in this project area.

CALCASIEU RIVER AND PASS PROJECT

Modifications to this project were authorized by the Rivers and Harbors Act of 14 July 1960. These modifications consist of enlargement of the existing ship channel to provide an approach channel 42 feet deep and 800 feet wide in the Gulf of Mexico, a channel 40 feet deep and 400 feet wide extending from the jetties to Lake Charles and enlargement of the existing turning basin at mile 29.6 to a depth of 40 feet, a mooring basin 40 feet deep, 350 feet wide and 2,000 feet long at mile 3; extension of the existing ship channel (35 X 250 feet) upstream to U. S. Hwy. 90, with 750 X 1000 X 35 foot turning basin at the upper end, and maintenance of the existing 12 X 200 foot channel in the old bend of the Calcasieu River to Cameron, La.

We have attended various meetings with local interest, Corps of Engineers officials and representatives of the Louisiana Department of Public Works.

Pursuant to fish and wildlife interests we have made investigations and presented our views concerning spoil placement and recommended spoil retention dikes to prevent movement of this material onto oyster beds, navigation openings and encroachment into shrimping and sport fishing areas. Considerable trouble has occurred in the past because of a perpetual easement to deposit spoil anywhere and in any manner expedient to the maintenance operations associated with the present project. This particular situation has been a problem and with the new project authorization steps are underway to prevent a recurrence of this type of difficulty.

OTHER PROJECTS CONSIDERED OR CONTINUED

The Mississippi River and Tributaries Project Review was completed in 1959. Since that time more intra-agency coordination conferences have been held in order to review segments of this project with reference to establishing recommendations for preserving and developing fish and wildlife habitat. Personnel of this division cooperated with personnel of the Branch of River Basin Studies of the U. S. Fish and Wildlife Service. Some of the segments included were "The Introduction of Freshwater into the Marshes Below New Orleans", Red River Backwater Area, etc. Navigation projects such as Cypress Bayou and Waterway, Petit Anse, Tigre, and Carlin Bayous, Bayou Bonfouca, and Little Calliou Bayou were completed and this section reviewed and offered recommendations pertaining to preserving and safeguarding fish and wildlife habitat within the scope of these projects.

Flood control projects under construction and under study by this section are: Red River below Denison Dam Texas, Oklahoma, Arkansas and Louisiana, and Boeuf-Tensas Rivers and Bayou Macon Channel Improvement. In the Bayou Macon segment of the above named project three loops were created as a result of the channel improvement work. Our interest in this project was to provide water control structures at one end of each loop cutoff to provide for additional fishing opportunities for the local people of the area. Also with inclusion of the control structure a fisheries management progam could be carried out to promote and prolong fishing success.

Several meetings, and public hearings were attended and reports representing fish and wildlife interests were given. Some of these related to Bodcau Lake, Bayou Lafourche Jump Waterway and Bayou Bartholomew, which are Corps of Engineers projects. Surveys and small watershed plans were reviewed and coordinated with the Soil Conservation Service. The most important of these were the Upper Tensas Drainage Project, Bayou Blue Watershed Development and the Bayou Boeuf Watershed Development. The former projects are specifically to provide for flood control and the latter is designed to provide water for irrigation and fish and wildlife development. Local interests cost share in these projects with respect to project features which are included in the final work plan as approved by all interests.

This section maintains an active interest in all areas that pertain to fish and wildlife resources. We are contributing through long range planning, coordination and other functions to the general knowledge about the natural environments of all our resident; and migratory fish and game animals. We have been particularly interested in the estuarine and coastal waters of the state for the preservation and improvement of fish and wildlife resources. This has been accomplished mainly through continued participation in the Gulf State Marine Fisheries Commission. We have constantly sought for the recognition of the fact that Louisiana, because of its vast coastal and estuarine area, is and can continue to be the greatest producer of shrimp, oysters and other marine forms so necessary to the overall economy of all the gulf states. We will continue to propose projects for evaluation with our goal being the advancement of our current knowledge and understanding of these various ecological requirements necessary to the enhancement and preservation of our gulf and estuarine resources. Our work has led to a sustained effort to stain or mark shrimp so their movements can be traced so we will better understand this species and the information obtained in this study can supply us with the facts necessary to institute a progressive management program. Members of this section were instrumental in working with personnel of the Oyster and Water Bottoms Division of this Commission in initiating and conducting the first successful shrimp staining program here in Louisiana. Since that time additional efforts have been made and many thousands of shrimp have been marked. This program is slated to be continued by the Commercial Seafoods section of the Oyster and Water Bottoms Division. It is hoped the data collected from these studies will answer many of the questions pertaining to the biology and biometry of our shrimp populations.

In conclusion, cold hard economic facts dictate that the preservation and management of existing fish and wildlife habitat is the only realistic approach to future "water control" fish and wildlife problems in Louisiana. Extensive rehabilitation and remedial replacement costs are almost always out of the question. The only feasible method or approach to this problem is complete study, careful planning, factual evaluation, and intense coordination for a multi-purpose approach when considering any water control project. Frequently a single project will detrimentally affect a greater area than the entire development program this Commission has been able to accomplish over a many year period. Even though people are interested in these projects they are not aware of the gross results and the changes a water control project have upon the natural character and quality of an area. To meet these problems squarely and to satisfy these many needs this section must be appropriately staffed, with highly trained technicians so they may keep abreast of the growing number of projects that so drastically affect fish and wildlife habitat. It is of paramount importance to keep tabs on all of these projects and submit qualified evaluations and recommendations so the fish and wildlife resources will be protected and enhanced for us to use and enjoy for generations to come.

CHARLES SHAW
Assistant Pittman-Robertson Coordinator

Game Section

STATEWIDE WILDLIFE DEVELOPMENT AND OPERATIONS PROJECT 30-D

KENNETH C. SMITH
Project Leader

During the past biennium the acreage available to the hunter in the form of game management areas has almost doubled—from 248,000 in 1959 to 450,000 in 1961—and has offered shooting on all game species legal in Louisiana. There are in addition 170,000 acres of marsh and artificial impoundments, 40,000 acres of Red River overflow bottomland and 34,000 acres of hardwood timber land in the Bayou Lafourche bottom, all of which are either leased or owned outright by the Louisiana Wild Life & Fisheries Commission and all open to public hunting and fishing. Of the above, 600,000 acres were leased and made available through the efforts of the Federal Aid Section, Fish & Game Division.

The following reports by the respective District Game Supervisors give ample detail on size, topography, species available, etc., on the presently existing public hunting areas but they do not mention the enormous amount of huntable land which has been placed in private shooting preserves and generally removed from public access. The acreage in closed lands amounts to many times over that amount set aside by this organization for public hunting and fishing. There is, of course, considerable land which belongs to companies and other land owners which continues to be open at the present but there is no guarantee this will remain the case. The often heard truism to the effect that "people are increasing but the land is not" is being brought home to us every day in the form of new POSTED signs and NO TRESPASSING notices. As overcrowding and abuse continues to increase on the remaining open land, so increases the number of POSTED signs.

A disturbing trend that has become quite noticeable in recent years is the private leasing of hunting rights on areas that develop desirable game populations as the result of costly restocking and increased protection afforded by the Commission. This organization does not plan to reduce its efforts to develop and harvest better game populations, so the principal means left open to counteract the above trend is to lease the lands, where possible, before it begins to command a premium price for hunting rights. Local opposition is often voiced at this attempt by the Commission to lease their favorite hunting spot. It is felt by many that the state might make a refuge of the area and keep everyone out. Some think this is wrong in that they see too much government interference in their inherited rights. Granting there is much truth in this, the persons who are assigned the responsibility of providing hunting rights to increased acreages feel it is much better to paint a line around 10,000 acres and erect PUBLIC HUNTING rather than NO TRESPASSING signs.

At least four areas, the smallest of which is 15,000 acres, are under consideration for game management leasing at this time. If they show promising potential and the land owner is agreeable, the Commission will consider the proposed lease agreement.

Many are the disappointments which invariably confront the persons who attempt to guide the development of potential public hunting areas past the conflicting expressions of interest by all individuals or groups concerned. It is a considerable source of satisfaction, though, when the area does mature and begins producing hunting opportunity on a scale never before realized.

An aspect of game management hunting, many hunters object to is the requirement that each person check in and check out at the same place and on the same day. One of the main reasons this is done is to obtain almost complete kill data on each hunt for the purpose of more efficient management. Another reason is to have the kill information in order to readily illustrate to the local public that a high annual yield can be expected without affecting the carry-over breeding stock for the following season. After this management aspect becomes accepted by the public in general, there will cease to exist a need for rigid control of the areas.

The technical field supervisors of the Louisiana Wild Life and Fisheries Commission's Fish and Game Division are shown above. Front row, sitting, Dewey Wills, District IV, Ferriday, and Clyde Harrison, District III, Alexandria. Back Row, left to right, Robert Beter, District VIII, New Orleans; Henry Roberts, District VII, Baton Rouge; Jack Sims, District V, DeRidder; Kenneth Smith, Development Project Supervisor, Baton Rouge; J. B. Kidd, District VI, Opelousas; John L. Haygood, District I, Minden. Not shown, Clifford T. Williams, District II, Monroe.

DISTRICT I

JOHN L. HAYGOOD

Supervisor

JAMES H. TAYLOR

Biologist

District I is located in the northwest corner of Louisiana and is made up of the following parishes: Bienville, Bossier, Caddo, Claiborne, Red River, Webster and DeSoto. There are three game management areas in the district, they are Jackson-Bienville, Bayou Bodcau, and Soda Lake. The latter being used primarily for waterfowl.

Most of the work in District I is done on the game management areas; however, various requests from within the district pertaining to predators, hunting permits, etc. are also handled. Personnel of this district are called on for assistance and guidance in wildlife work by other public agencies.

BODCAU WILDLIFE AREA

KINSEY MARTIN

Area Supervisor

Bodcau Game Management Area is located on the U. S. Army Corps of Engineers' Bodcau Flood Control Project. Through a co-operative agreement the Corps of Engineers gave the Louisiana Wild Life and Fisheries Commission a license to develop and manage the wildlife on this area. The boundaries include all government owned land lying along Bayou Bodcau from the Arkansas State Line to Bellevue in Bossier and Webster Parishes, approximately 37,000 acres.

The purpose of this management area is to provide public outdoor recreation in the form of hunting, fishing and camping. This can be accomplished only through the development of roads, picnic areas and camping areas as well as habitat maintenance and improvement for game species.

Bodcau is potentially one of the best Game Management Areas in the state. This is due primarily to the various habitat types found within it which makes it possible to establish a huntable population of all game species, with the exception of geese, that are present in the state today. The flexible working agreement that we enjoy on this area allows the Commission to manage the timber for wildlife production. This is one big advantage Bodcau has over most other Game Management Areas in the state. By the Governor's proclamation of October 1961, Bayou

Bodcau now falls under the same regulations as other game management areas. The bulk of the work on this area is habitat development and maintenance. Development includes the development of our game populations. There has been an increase in all game populations and larger increases are expected in the future as a result of habitat improvement on the area.

Turkey food plots and open areas have been established and maintained so that a suitable habitat will be present when seed stock can be secured for this area. The food plots will produce buckwheat, millet, milo, chufa and wheat to supplement the natural foods found in the area. A Bush Hog will be used to maintain these open areas that seem so important to turkey habitat.

An area is being fenced for the enclosure of Bison which we hope to obtain in 1962. This same area will also afford an experimental area which will be used in 1962 for some rabbit experiments. This 7 miles of fencing will serve as an exclosure against livestock as well as an enclosure for Bison. This will make much more food available for other game species on the area as they will not have to compete with livestock for their food. The Bison herd will be controlled and kept at a minimum number as it will be maintained for public relations purposes.

The development and improvement of existing habitat has been and will continue to be easier on this area due to a program of tree stand improvement for wildlife. This program allows for the manipulation of the timber stand toward the goal of producing a maximum yield of mast and cover types for various game requirements. Most of the upland area south of the Cotton Valley road has been type mapped to afford a better insight as to the needs for habitat improvement in all areas.

In accordance with the habitat improvement plans, 20,000 hardwood seedlings (5,000 Cypress, 5,000 Water Oak, 5,000 Red Gum, 2,500 Cherry Bark Oak, and 2,500 Shumard Oak) were planted in old fields which are low lying or subject to flooding. As of July 1, 1961 approximately 80% survival was noted. More plantings of this type will be made in the future as timber work develops.

Maintenance work, while not as interesting perhaps as development, is very important if the effects of the development on an area are to have a lasting effect on game populations.

The maintenance of roads, dams, food plots, food plot fences, and boundary lines requires considerable time and effort on the part of district personnel.

There has been a vast improvement in the roads on this area in the past two years. Since this area receives an abundant amount of rainfall and often in heavy downpours, it is necessary to spend considerable time working on the roads. This work consists of cutting side ditches, grading, cleaning out culverts and hauling gravel for surfacing the roads. These flash floods may wash out a culvert or several yards of fill from the road bed.

The maintenance of dams on Bodcau depends mostly on whether or not we can get the necessary heavy equipment. The dams were not built to specifications due to the limited working time of the heavy equipment. Wet weather and need for the equipment in other areas were the limiting factors here. We had hoped to be able to bring these dams up to specifications in 1961, but again the weather and other needs prevented it.

The maintenance of food plots and food plot fences usually requires a minimum of work as we are not interested in clean row farming. We rely on fertilizer to produce quality foods rather than a quantity of food. Many so called weeds produce good wildlife food. The fence maintenance is not much of a problem if an adequate fence is built around the plot. An exception to this is the rusting out of fence that is under water part of the year. It must then be replaced about every 3 years.

The maintenance of boundary lines plays an important part in the function of an area. These lines help prevent illegal hunting and contains the hunters on the area when differential seasons between the Game Management Area and the surrounding area are in progress.

The painting of these boundary lines is done by district personnel. The almost inaccessible areas through which the lines run makes this difficult work at times. Bodcau has 152 miles of boundary which must be repainted every 5 to 6 years. This has been accomplished in the past as a joint operation with the Corps of Engineers.

Several picnic sites have been cleared and 2 water wells completed. The Corps of Engineers is tentatively planning to develop 2 camping areas on the east side of Bayou Bodcau.

The Corps completed a modern rest room near the dam in the summer of 1961.

JACKSON-BIENVILLE GAME MANAGEMENT AREA

FLOYD SIZEMORE

Area Supervisor

The Jackson-Bienville Game Management Area is located in the eastern part of Bienville Parish and the northwestern part of Jackson Parish, about 12 miles south of Ruston and 12 miles north of Jonesboro. The area is on private land which is leased by the Louisiana Wild Life and Fisheries Commission for a 10 year period. The lease has been renewed the 1st time in 1961. The largest landowner is the Davis Brothers Lumber Company.

This area is out of the development phase of operation. Maintenance of roads, boundary lines, food plots, salt licks and predator control is carried on by the area supervisor, district personnel and equipment operators when assigned to use their equipment on the area.

The managed hunts on this area include; gun and bow hunts for deer, squirrel and rabbits.

The squirrel gun hunt ran from October 1 through October 9, 1960. The check stations were manned and permits issued on a daily basis. This hunt produced 2,826 squirrels for 1,399 hunting efforts.

In 1961 the squirrel hunt ran from October 7-October 27th. Permits for the gun hunt were handled on a seasonal basis. This was something new and the source of much controversy, but we received several letters complimenting us on this practical method of handling the permits. Check stations were not manned and only random spot checks were made of the hunter bag. Very few spring squirrels appeared in the bag and the 1961 summer squirrel crop didn't appear until around October 20th. Post season observations show many more squirrels in the woods than were present at the start of the season.

The archery season produced 3 reported deer kills in 1960 and 1 reported deer kill in 1961. These hunts were conducted on the basis of issuing a season permit which was good for the full 10 days in 1960 and 16 days in 1961. This permit also allowed the bow hunter to take squirrel and rabbit with his bow only. No kills of these species were reported.

A 5 day gun season, consisting of four days of bucks only and one day of any deer hunting was held in both 1960 and 1961. In 1960 there were 44 bucks and 32 does killed in 2,616 hunter efforts. In 1961 there were 123 deer killed in 2,350 hunter efforts. We feel that we are falling far short of our goal to remove enough deer to prevent destruction of browse on this range. Changes in our present hunting seasons and game laws must come about if we are to let the hunter harvest the deer rather than letting disease and starvation take them.

SODA LAKE WATERFOWL MANAGEMENT AREA

KINSEY MARTIN

Acting Area Supervisor

This area lies some 15 miles north of Shreveport. Soda Lake is on 600 acres of land of which about 500 acres is flooded when water is at the desired level. Soda Lake is part of an old lake bed across the south side of which was constructed an earthen terrace 600 feet long with an average height of 5 feet. Another terrace of 1,400 feet in length was constructed with an average height of 3 feet, about midway of the area to be flooded. Still another terrace 3,800 feet long with an average height of 2 feet was constructed on the upper end of the area. This latter terrace prevents the flooding of adjoining private property. A fourth terrace some 450 feet long with an average height of 3 feet was incorporated into the plans of construction. The purpose of this terrace being to drain the upper impoundment directly into Twelve Mile Bayou. In years of abundant rainfall enough water can be trapped to flood the area, but in dry years water will be obtained from Twelve Mile Bayou which bounds the impoundment area. The water from Twelve Mile Bayou will be lifted by a large volume low lift pump that has already been purchased by the Department of Public Works. The pump is mounted on a barge and has a fuel barge with it. Since it is mobile this will enable us to use the pump on other green tree impoundments in the district should other areas similar to Soda Lake be developed in the future. This area has abundant food plants such as smartweed, lampshade, etc. Some discing was done in order to encourage the growth of these natural foods and in the future some planting will be done of plants such as rice and chufa.

DISTRICT II

CLIFFORD T. WILLIAMS

District Supervisor

CHARLES R. BAUR

Biological Aide

GUY CAMPBELL

Biological Aide

The Fish and Game Division's District II is comprised of eight parishes within the north and northeast portions of the State: Jackson, Lincoln, Union, Ouachita, Richland, Morehouse, West Carroll, and East Carroll. Game populations vary from low to high and habitat characteristics are rated from poor to excellent depending on the species involved and area location. Because of the ecological regions found in the form of the Mississippi-Tensas-Ouachita Alluvial Plains and the Northwest Louisiana Uplands, forest types present range from mixed hardwoods in the bottomlands (Delta and hill stream bottoms) and high terraces (Macon Ridge) to pure pine and mixed pine-hardwoods in the hill country.

During the past biennium the duties of District II personnel dealt mainly with the operation, maintenance, development, or management phases of wildlife projects on three game management areas, four public hunting areas, one refuge, one foreign game bird release area, and the management of game species within the remainder of the District. Secondary duties included routine assignments concerning public requests, complaints, and inquiries and administrative work. Some District activities, those connected to research with one exception, will be found in other parts of the biennial under reports submitted by the research study leaders.

A report on the game programs and projects carried out in District II during the 1960-61 biennium is as follows:

UNION GAME MANAGEMENT AREA

CURTIS L. HOLLIS

Area Supervisor

The Union Parish Game Management Area was established in 1949 upon lands owned by Olin Mathieson Chemical Corporation and several small landowners in the north central part of Union Parish. It comprises an area of approximately 10,000 acres of second growth pine (loblolly and short leaf) and mixed hardwoods with a moderate to dense understory. The topography is rolling hills with small streams intermingled throughout the area.

During the past two years the work programs as outlined under the Federal Aid Projects have been carried out. This included maintenance of boundary lines, roads, salt licks, food plots for turkey habitat improvement, and the overnight cabin.

MANAGED HUNTS

Controlled hunts for squirrel and deer have been held each year for 1960 and 1961. The results of these hunts are shown below.

Squirrel. The area was open for 16 days between October 1-19, 1960, with daily permits being issued to each hunter. A total of 402 hunting efforts were made and 1090 squirrels were killed (126 fox squirrels and 964 gray squirrels); an average of 2.71 squirrels per hunter. More hunters used Union in 1960 and killed more squirrels per hunting effort than any year since the area was opened in 1955. Hunting pressure was greatest on weekends.

During 1961 a twenty day season was held from October 7-27 with season length hunting permits being issued prior to the opening day. Spot bag checks made by the Area Supervisor and District II personnel indicated that hunter success was not as good as for 1960. This could be blamed on several factors. Very dry woods conditions and warm weather existed which caused decreased hunting pressure. A very good mast crop was present on the area and sqiurrels were on the ground earlier than usual. Regardless of the weather and mast conditions, the hunter still bagged 1.51 squirrels per hunting effort.

Deer. A five day controlled hunt was held between November 24-28, 1960, for buck deer only. Only 272 hunting efforts were made and 5 deer were killed. The hunt was termed successful, yet, a very low number of hunters participated when comparing hunting efforts with those of previous seasons. A decrease in hunter effort was expected as new territory and game management areas were being opened to the public for the first time.

In 1961, the deer season was opened for 5 days with the last day being open for the taking of any sex deer. A total of 595 hunting efforts were made and 45 deer were removed from the area.

EAST CARROLL GAME MANAGEMENT AREA

FEDERAL AID PROJECT

RUSSELL CAMPBELL

Acting Area Supervisor

The East Carroll Game Management Area comprises approximately 9640 acres of bottomland hardwood habitat in the southern part of East Carroll Parish. A ten year lease was obtained by the Commission in May, 1960, from the Chicago Mill and Lumber Company. Game species present include squirrel, rabbit, deer, and black bear.

The exterior boundary around the area was brushed out with a D-7 dozer, a white line was painted on line trees, boundary markers were erected, and entrance markers were placed at the main access points.

The area was open to a controlled squirrel and rabbit hunt from October 7-28, 1961. Spot checks were made by the Acting Area Supervisor and District II personnel. Average kill per hunting effort was 2.9 squirrels. Hunting pressure was light on the area and only 65 hunters were checked.

The controlled deer hunt was held from November 24-28, 1961 for buck deer only. During this period 2 deer were killed from a total of 62 hunting efforts.

As the East Carroll Game Management Area lies within the area scheduled for a black bear season, it will be opened to still hunters for a period of five days. This is the first season on black bear since 1955. Black bear sign is observed frequently by field personnel, but the population is still low.

OAK RIDGE BLACK FRANCOLIN RELEASE

As an effort to add another game bird to the list of those available in Louisiana, the Black Francolin has been introduced into the State by the Louisiana Wild Life and Fisheries Commission for experimental study upon recommendation of the Interior Department's Fish and Wildlife Service.

An area near Oak Ridge, Louisiana, was selected as one of two release sites. Through the courtesy of Mr. Erle Barham and William Barham

Cliff Williams, biologist, Supervisor for District II, is seen recording data on a black francolin hen prior to release in Morehouse Parish.

approximately 5,000 acres of land was obtained for the initial release. The shipment was received on April 19, 1961, and 152 francolins were released on the area by April 27.

Nesting attempts on the area have been verified by Mr. Erle Barham and District II personnel, and several broods have been reported by farm tenants. A more detailed report will be found in another section of this biennial.

RUSSELL SAGE WILDLIFE MANAGEMENT AREA

The purchase of the 15,000 acre Russell Sage Wildlife Management Area in December, 1960, marks the first successful attempt on the part of the Louisiana Wild Life and Fisheries Commission to secure lands solely for wildlife management and recreational purposes in the state. Experiences with public hunting on our game management and public hunting areas during the past few years have emphasized the need for an expanded program of this type.

This area was purchased with funds from the Russell Sage Foundation of Louisiana and is located in the LaFourche Swamp east of Monroe. Its lands lie within parts of three parishes (Ouachita, Richland, and Morehouse) and extend from the southern part of Wham Brake on the north almost to Louisiana Highway 15 on the south. The major forest tree species present include overcup oak, bitter pecan, willow oak, water oak, striped oak, ash, elm, some cypress, and willow. Game species on the area include deer, squirrel, rabbit and waterfowl.

Plans and programs as outlined for the Russell Sage tract are being formulated to develop the area from a wildlife standpoint and to provide the maximum amount of usage by the general public. Wildlife improvement and other development projects scheduled for the area cannot be completed in one year and must be of a long range type covering a period of several years or as funds permit.

Work has begun on the establishment of the exterior boundary, one entrance marker has been erected on the south side of old U. S. Highway 80, and a fill for a headquarters building site and access road have been constructed. Parts of the area show good potential from a waterfowl standpoint in the form of green tree impoundments. The area was open for public hunting in 1961 for all game species according to statewide regulations and seasons except for deer. The deer season will be open in 1962 on a controlled hunt basis.

LAFOURCHE PUBLIC SHOOTING AREA

The LaFourche Public Shooting Area is located in Richland Parish approximately 10 miles west of Rayville on U. S. Highway 80. The primary interest in this area is squirrel and waterfowl hunting. The area is composed of 1875 acres of bottomland hardwoods which were flooded naturally in prior years and provided excellent waterfowl hunting. With the LaFourche drainage program, this area has not been capable of holding water by natural means. By blocking the gaps in the spoil bank and installing two water control structures the area can be flooded with water from Irwin Lake via Little Lake LaFourche and Crew Lake to the public shooting area.

The area provided fair to good waterfowl hunting in 1960, but heavy spring rains and floodwaters damaged one control structure making it impossible for use in 1961 for waterfowl. Squirrel hunters utilized the area in 1961 with good success.

Repairs to the control structures are being considered and probably will take place early in 1962 unless road work on the new U. S. Interstate Highway 20 makes such construction unprofitable with regards to a waterfowl shooting area of this type.

FISHER CREEK PUBLIC HUNTING AND FISHING AREA

The Fisher Creek Public Hunting and Fishing area is located three miles west of Sondheimer, Louisiana in East Carroll Parish. It is composed of approximately 500 surface acres of water suitable for fishing and waterfowl shooting. Land for this area has been secured from the H. L. Hunt Oil Company and the East Carroll Parish School Board for use by the general public.

The area was constructed by placing small earthen dams at each end of Fisher Creek Brake and an overflow spillway on the western side. Timber species on the lake include cypress with mixed bottomland hardwoods dispersed throughout the flooded area.

Fair to good waterfowl shooting and fishing was enjoyed during the past two years. This impoundment has also increased the catch of local commercial trappers since reflooding of the old brake began.

SHILOH CREEK PUBLIC SHOOTING AREA

Shiloh Creek Public Shooting Area includes approximately 1200 surface acres of water and is located five miles west of Vaughn, Louisiana. It borders Terzia Refuge on the north side and was constructed for waterfowl hunting primarily. Fishing in past years has been good from the shooting area to the point where Shiloh Creek enters the Ouachita River.

The area is referred to as a green tree reservoir and was constructed by placing a dam across Shiloh Creek. Water levels are regulated by means of a water control structure located on the dam.

Shiloh Creek has provided good mallard and wood duck shooting in the past. The area lies within the Ouachita River bottom, a region noted for its duck shooting.

FINCH BAYOU PUBLIC HUNTING AND FISHING AREA

The Finch Bayou Public Hunting and Fishing Area is composed of roughly 600 surface acres of water and was constructed in 1956 on Finch Bayou in Union Parish. The area is located approximately four miles east of Haile, Louisiana, near the Ouachita River. Construction on the area consisted of placing a dam on the upper end of Finch Bayou and raising the height of the existing dam on Harrell Lake. A control structure was added to the Harrell Lake dam for draw down and water fluctuation purposes.

The area is subject to annual overflows from the Ouachita River, making fishing better than if the water level remained constant from year to year. Very good bass and bream fishing was available during 1960 and the first half of 1961. Waterfowl hunting was fair in 1960 on the western parts of the area. Fishing and hunting was affected during the last half of 1961 as most of the water was drained to permit the repair of gas lines in the northern part.

A new concession stand and boat rental area has been constructed by the Union Parish Police Jury at a more desirable spot above the old site.

TERZIA REFUGE

The Terzia Refuge is made up of 46,000 acres of mixed hardwoods and pine-hardwoods in the central portion of Morehouse Parish approximately 5 miles northwest of Bastrop, Louisiana.

Development work has been discontinued on the area. Enforcement personnel along with Fish and Game personnel have patrolled the area against illegal hunting.

The area supports a good deer herd and several flocks of wild turkey. General condition of the deer herd is not as good as for adjoining parishes. There is much competition for browse plants by cattle and the hog population reduces the available mast supply.

Terzia is one of the oldest refuges in the State and Louisiana sportsmen have not sampled its full capabilities. At present, hunters are reaping benefits only from the fringe areas around the refuge. Many animals are born, live, and die within the refuge and are not available to local hunters because the average daily and seasonal game range is usually of comparatively small size. Hunters will start realizing major benefits from this area when it becomes available to them in the form of managed hunts. This will not happen as long as the area remains a refuge.

DISTRICT III

CLYDE E. HARRISON

District Supervisor

ROLAND P. VERNON

Biologist

RAYMOND C. PALERMO

Biologist

During the 1960-61 biennium, two Game Management Areas have been lost through termination of leases and two have been added. The Sabine No. 1 in Sabine Parish and the Grant-Rapides G.M.A. in northwestern Rapides and southeastern Grant Parish were lost and the 52,000 acre Fort Polk G.M.A. in south central Vernon Parish and the 55,000 acre Lutcher-Moore G.M.A. in western Vernon Parish were added. The latter area is a Fish and Game project while the others in this District are supported through the Pittman Robertson Program.

The loss of the Grant-Rapides area particularly is regrettable as the managed deer hunt produced fine animals and promised hunters a better chance to get a trophy than other central Louisiana G.M.A.'s. Being primarily bottom land hard wood it also offered better squirrel hunting than the other areas.

Valuable information on squirrel life history, movements, longevity and hunter success was gained from the area and more importantly, the data was increasing in scope yearly. Fortunately, the Commission has another area, with a possibly greater squirrel population potential where this work may be continued.

District activities have continued in a more or less routine manner. As the deer herds increase, more incidences of deer damage to crops are noted. Opening all the G.M.A.'s to deer hunting at the same time lessened the hunter congestion. A new method of issuing squirrel permits in the areas was tried for the 1961 season and met with some success. Applications were to be made by writing or coming in person to the District office. Although every medium of informing hunters of this procedure except direct contact was used, there were still quite a number who appeared on the areas expecting to get their permit at a check station. Generally, hunters were pleased with this system as it eliminated "lining up" at the permit station to receive and return the permits.

A brief report on the District III Game Management Areas follows:

CATAHOULA GAME MANAGEMENT AREA

VOLMER BOWEN

Area Supervisor

This area is located on U. S. Forest Service lands in Winn and Grant Parishes. It comprises an area of approximately 40,000 acres and contains a mixture of second growth longleaf, loblolly and shortleaf pines and hardwood. The topography varies from gently rolling hills to poorly drained flats. There are few running streams on the area with the exception of Iatt, Indian and Bear Creeks which furnish most of the drainage.

Activities on this area in recent years have been more or less maintenance except for the managed hunts with a small deer trapping operation in the spring of 1961. The boundary has been maintained and supplemental food plots have been mowed yearly. Some road work was accomplished.

Deer Trapping: In order that typical deer could be placed within the three 160 acre deer enclosures of 32R, a small trapping operation was undertaken. Only juvenile does were to be placed in the enclosures and others caught were tagged and released at the trapsite. Of the fourteen deer required for the study thirteen were trapped on this area and the fourteenth was taken from Red Dirt. During this operation, a total of seventy-two deer were handled including thirty-one retraps.

MANAGED HUNTS

DEER—The 1960 hunt, for legal bucks only, was held during the first three days of the open season. Originally, the hunt was to have been for bucks the first four days with the fifth day for deer of either sex. Local opposition to the proposed hunt resulted in only three days of hunting. All hunters were required to have a permit and all deer killed were checked at the central checking station.

Each deer was weighed, aged and a section of each available liver was preserved. The effects of the herd reduction brought about by the one day any deer hunt in 1959 were reflected in the increase in weight and the improved antler condition of deer killed during the 1960 hunt. During the three days 1541 hunters took sixty-nine deer.

The hunt in 1961 was held during the first five days of the open season with the first four days for bucks and the fifth day for bucks and does. The manner of issuing permits was like that of the past and each deer killed was checked and data regarding physical characteristics were recorded. During the first four days 1734 hunters took 54 deer and on the fifth day 124 deer were killed by 1484 hunters.

SQUIRREL—The 1960 squirrel hunt was held during the mornings of October 1-5th. Hunters were required to check in and out and all squirrels killed were checked. During this period, 866 hunting efforts were made and a total of 2597 squirrels taken. The average bag of three squirrels was the best recorded on this area during the four hunts held.

In 1961, the hunt was held during the period October 7 through October 28. Hunters were allowed to hunt all day and were not required to check in or out but were required to have a season permit. Spot checks were made of hunter success and checks made indicated an average bag of 1.7 per hunter effort. Success was not as good as last year and quite likely was due to the abundance of mast. As plenty of food was present, squirrels were not quite as active and were not as concentrated in certain areas as has been the case in recent years. A total of 570 bag checks was made with 950 squirrels being checked. The number of permits issued was 1857.

EVANGELINE GAME MANAGEMENT AREA

HORACE STILES

Area Supervisor

This area is located on U. S. Forest Service lands in south-central Rapides Parish. It contains 15,000 acres of second-growth longleaf and loblolly pines and mixed pine and hardwood. Topographically, the area is made up of gently rolling hills which afford a good drainage pattern.

There are five spring fed streams that have year around water except in very dry years. Brushy and Long Branches drain to the north, Roaring Creek drains to the south, and Rocky Branch and Bayou Clear drain westward and eastward respectively.

Maintenance activities include work on fences, boundary, jeep roads and bridges and overnight cabin. Annually, the eight food plots are planted with a wheat and vetch mixture to attract deer to openings where they will be more available to hunters. In practice, this has not worked as hunters tend to use the plots for parking areas. As these plots are fenced and therefore not available to the large number of cattle ranging on this area about one half acre in each plot has been planted to quail foods.

MANAGED HUNTS

Archery hunts for deer were held during five week-ends of October and November, 1960, for a total of fifteen days and during the period, October 28-November 12, 1961. Permits for these two hunts were issued at all District offices with forty-nine being issued for the 1960 hunt and eighty-seven for 1961. The number of archery hunting efforts are unknown for either period as hunters were not required to check in or out. Observations indicate that fewer hunters were on the area than during the first three hunts. This could be attributed to hunts of this nature on additional areas. Two deer were taken in 1960 and one in 1961.

Gun hunts for deer were held on November 24 through November 28 in 1960 and 1961. In 1960, 2226 hunting efforts were made with a kill of 154. The first four days, when only legal bucks were taken, forty-one animals were bagged. On November 28, the "any deer" day, 881 hunters took 113 deer, seventy-two of which were females. During this five day period, the average hunter success was one deer per fourteen hunting efforts. In 1961 with a similar season during the five day November 24 through November 28 season, 2425 hunting efforts resulted in a kill of 125 animals, 70 bucks and 55 does.

Squirrel hunts were also held during this two-year period. In 1960, during the three day period October 1-3, 137 hunting efforts took 160 squirrels for an average of 1.3 squirrels per effort. During that hunt, daily permits were issued on the area and each hunter's kill was checked. In 1961, season permits were issued at the District office for the weekends of October 7, 14, and 21. Spot checks only were made with an average kill of 1.5 squirrels per effort. This figure is based on seventy-nine hunter efforts. A total of 370 permits were issued but the total of hunting efforts actually made is unknown.

The quail hunt in 1960 was held December 10-12, 1960, February 3-5, and February 10-12, 1961. Each hunter was checked in and out. A total of 191 hunting efforts was made with a kill of 247 quail which averages about 1.3 birds per effort. In 1961 the quail hunts were held too late to be included in this report.

The managed hunts on this area have attracted numerous hunters who wished to camp. Camping is not permitted on the Game Management Area. Therefore, a use permit for 10 acres for this purpose was obtained from the U. S. Forest Service and located adjacent to the area.

Initially five acres were staked off for this use and shrubby vegetation cleared from individual camp sites. Two toilets were constructed and a water well with a hand pump drilled by contract.

FORT POLK GAME MANAGEMENT AREA

LESLIE DAVIS

Area Supervisor

This area, of approximately 52,000 acres is in south central Vernon Parish. Ownership is vested in the U. S. Army, U. S. Forest Service and a minor portion in private interests. It is primarily of longleaf pine type and is interspersed with several small streams with typica hardwood timber types. Principal drainage consists of Whiskey Chitto, Drake's, and Bird's Creeks which all originate within the limits of this area. Portions have stands of second growth pines with associated upland oaks. Also there are areas of typical denuded "cut-over".

A working agreement with the respective owners was negotiated in 1960 and the primary activities have been concerned with establishing and marking boundaries.

This area is being treated differently than the other G.M.A.'s in that hunters are permitted to hunt any game in season as long as the game species is legal in that portion of Vernon Parish The only restriction imposed on hunters is that use of squirrel dogs and bird dogs is not permitted during the open deer season. In 1960 the deer season was from November 24 through December 8; in 1961 the seventeen day season was held from November 24 through December 10 Hunters wishing to hunt in this area are required to obtain season permits from the Commission office in Alexandria or DeRidder.

As hunters are not required to check in or out, participation and kill is unknown. Efforts are made to check as many animals as possible but the size of the area with its numerous roads precludes even an estimation of total kill.

Although not on Fort Polk, itself, an area immediately adjacent to it, the 30,000 acre Vernon Division of the Kisatchie National Forest was treated with the aim of increasing existing quail populations. Thirty foot wide strips were disked throughout this area and planted with common lespedeza. These strips were of varying lengths and generally followed land contours. Approximately 210 acres of such strips were planted. As originally planned, 400 acres of strips were to have been planted but was not accomplished due to the forested areas being larger than expected. These plantings have done well and should be reflected in greater quail populations during the 1961-62 quail season. It is anticipated that these strips should be productive for about three years after which a thorough redisking will be needed.

LUTCHER-MOORE GAME MANAGEMENT AREA

WOODROW SMITH

Area Supervisor

This area, of about 54,000 acres is located in west central Vernon Parish. The Commission negotiated an agreement with the Lutcher and Moore Lumber Company in late 1960 whereby the Commission would have the opportunity to manage game in the area for the benefit of hunters. Later, leases on smaller areas were obtained from the Southwestern Improvement Company and the Kirby Lumber Company to simplify the boundary location.

Basically, a longleaf timber type, this area is in the process of being established as a slash pine forest with plantations of all ages. There are numerous creeks with relatively narrow strips of hardwoods. It is felt that this area can afford sportsmen quail, squirrel, rabbit and deer hunting.

A nucleus deer herd exists already and this herd will be allowed to develop a few years before hunts for this species will be held. Plans call for hunting on this area to be based on season permits as on Fort Polk rather than daily permits. During the 1961-62 hunting season hunters may hunt any game species in season other than deer. The permits were available through Commission offices in Alexandria and DeRidder.

Work on this area was delayed until August of 1961. The boundaries are in the process of being painted and boundary signs placed. Entrance markers have been designed and ordered.

RED DIRT GAME MANAGEMENT AREA

H. C. BEASLEY

Area Supervisor

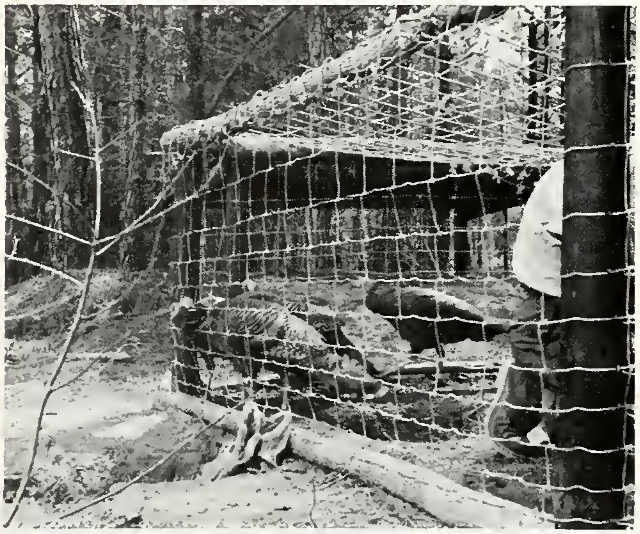
The Red Dirt Game Management Area is approximately 38,000 acres in size and is located in south central Natchitoches Parish. It contains a variety of timber types, including stands of pure pine, mixed pine and hardwood, and narrow stands of hardwood along the stream bottoms. The topography varies from gently sloping hills to rugged outcrops of sandstone. Drainage on this area is extremely good with numerous intermittent streams in all sections. Larger, spring fed streams with year around water include Livrogne Bayou, Steep Hill Creek, Horsehead Creek, Bayou Cypre, and Bayou Luce.

A wild turkey in flight after being released from Red Dirt Game Management Area.

Game management work on this area is of varied nature. Research projects as well as development practices are included in the activities. In addition, routine jobs such as road and boundary maintenance are necessary.

Turkey

For the past two years the major effort has been to try to increase the small turkey population that resulted from the introduction of a few birds in 1958. Fall and spring plantings are made on the numerous small food plots to give these birds ample feed. Plantings of wheat are made in the fall and plantings of brown top millet are made during the spring and summer. About 100 plots with a total acreage of 150 acres are planted in this manner. While planted primarily for turkeys, quail and deer derive much benefit from these plantings. The first two years after their introduction the turkeys increased their numbers considerably but since then have shown little increase.



Turkeys in trap on Red Dirt Game Management Area two years after release.

Deer

Since 1954 when the first deer were removed for restocking, 1,538 deer have been taken from the area through trapping and managed hunts. Few deer have been removed by trapping during the period of this biennium but surplus animals are removed through the managed hunts. During 1960, the hunts were held November 24 through November 28 with only legal bucks taken the first four days while deer of either sex were legal on the fifth day. During this period, 4,898 hunters took 177 deer; on the last day 1,623 hunters bagged 119. On the last day slightly more than half of the animals were female but represented 44 per cent of the total five day kill. In 1961 a similar hunt was held during the same dates of November. A total of 3545 hunting efforts were made during this period with 141 deer taken. On the last day 1354 hunters took 94 deer.

Deer being released at new location.

Quail

Though quail hunting is becoming more difficult on this area as the pine plantations close in and the extent of good quail range is curtailed, quail populations are still good enough to attract a few hunters. While probably not economically sound as not enough hunters come to the area, these hunts are scheduled to give hunters an opportunity to harvest these game birds. Hunters who learn the area are well satisfied with the hunting. Most hunters, however, spend a short while in the area and give up without making an honest effort. At first glance, which is about all most hunters give it, it does not seem to be a quail area. Singles shooting is rare but there are many covies which are never shot. Hunts were held December 10-14, 1960 and February 6-15, 1961 and during these fifteen days 221 hunters took 365 birds. Like hunts are scheduled for the 1961 season but have not been held at the time this report is being written.

To assist those hunters wishing to camp out during the managed hunts an area adjacent to the management area was secured from the U. S. Forest Service. Five acres were cleared of brush and a stock fence erected. Two privies, a garbage pit and a cattle guard were constructed. Water is furnished by a line from the Headquarters tank. Many hunters made use of this facility.

SABINE GAME MANAGEMENT AREA

W. LLOYD ALFORD

Area Supervisor

This area, located in central western Sabine Parish comprises 12,000 acres. Approximately half of the forested area is loblolly-shortleaf-hardwoods with the remainder hardwoods normally found along stream bottoms. The northern piney woods section is well drained with numerous small intermittent creeks while portions of the southern half are poorly drained. These poorly drained areas or flats are timbered primarily with water and willow oaks. The main drainage is through Choctaw Creek to the west, Hurricane Creek centrally, and the Bayou LaNana system to the east.

Activities on this area have been limited to road and boundary maintenance and managed squirrel and deer hunts.

MANAGED HUNTS

DEER—The 1960 hunt was held November 24 through November 27. During the first four days legal buck deer only were taken and on the 28th hunters were allowed to take deer of either sex. As in the past only a relatively few hunters came to this area and only eight deer were taken. A total of 409 hunting efforts were made with 192 hunters taking three bucks and two does on the final day. The 1961 hunt was held November 24 through November 28 and was also four legal buck days with deer of either sex being legal the fifth day. A total of 319 hunting efforts resulted in a kill of 4 animals. On the last day 155 hunters took 1 buck and 1 doe.

SQUIRREL—Hunters were invited to squirrel hunt on this area the first three days of the 1960 hunting season. As few hunters had turned out in previous years, permits were not required. The Area Manager reported only a few hunting efforts were made but that the few hunters experienced fairly good hunting. The squirrel hunt in 1961 was held October 7 through October 28, with a total of 376 hunters obtaining permits. Spot checks were made throughout this twenty-two day season with 224 squirrels, representing seventy eight hunter efforts, being checked. This average kill, 2.9 squirrels per hunter, was the best hunter success of District No. 3.

Entrance marker on Chicago Mill Game Management Area.

Buck being checked by Biologist, Cliff Williams, on Chicago Mill.

DISTRICT IV

DEWEY WILLS
Supervisor

BOB KIMBLE
Biologist

CHICAGO MILL GAME MANAGEMENT AREA

JIM PERRITT
Area Supervisor

The 100,000 acre Chicago Mill Game Management Area is located in portions of Madison, Tensas and Franklin Parishes. The Franklin Parish portion of this Game Management Area comprising 22,000 acres was obtained by lease in May of 1961. The Madison Parish portion comprised of the old Singer Game Reserve and Ayers Refuge was converted to a game management area in May, 1961. These acreages with the present 30,000 acres of the Chicago Mill Game Management Area gives a total of approximately 102,000 acres being operated as a game management area and designated as Chicago Mill 1 and 2.

In 1960 managed hunts for deer and squirrels were conducted on the Game Management Area. The results of the hunts are listed below:

Squirrels—The Game Management Area was opened to squirrel hunting during the first nine days of the regular season. This hunt opened October 1st. and ended October 9th. with hunting permitted until noon. The hunt was for still hunting only and the following table shows the daily hunting success of this managed hunt.

CHICAGO MILL G.M.A. NO. 1 AND 2 (1960)

Date	*Hunting Efforts*	*Squirrels Killed* *Fox*	*Gray*	*Total Kill*	*Average Kill Per Hunting Effort*
10-1-60	369	180	508	688	....
10-2-60	187	100	213	313	....
10-3-60	70	27	113	140	....
10-4-60	67	22	88	110	....
10-5-60	94	49	106	155	....
10-6-60	71	27	75	102	....
10-7-60	47	26	51	77	....
10-8-60	134	72	146	218	....
10-9-60	76	39	71	110	....
Total	1115	542	1371	1913	1.71

Deer—A five day deer hunt was held on the Chicago Mill Game Management Area on the Madison and Tensas portion the first four days were for bucks only; the last day bucks and does. On the Franklin portion only bucks were legal during the five day hunt. During the five day hunt on the Chicago Mill area there were 9,359 hunting efforts made and a total of 746 deer killed.

Results of this hunt are listed in the following table:

HUNTING PRESSURE AND DEER KILL BY DAYS
Chicago Mill No. 1 and 2, 1960

		Kill			*Bucks with antlers 3 in. or Better*		*Per Cent Total Kill*	
Date	*No. Hunters*	*Male*	*Female*	*Total*	*No.*	*Per Cent Total Kill*	*Male*	*Female*
November 24	2,178	93	5	98	92	22	12.0	0.7
November 25	1,512	65	...	65	63	15	9.0	...
November 26	1,457	52	2	54	52	13	7.0	0.3
November 27	976	27	...	27	27	6	4.0	...
November 28	3,236	180	322	502	71	17	24.0	43.0
TOTAL	9,359	417	329	746	305	73	56.0	44.0

During 1961 hunts for deer, turkey, squirrels and rabbits were conducted on the area.

Squirrels and Rabbits—The area was opened from October 7 through October 28 for squirrels and rabbits. This was still hunting only and permits were issued by mail. There was a total of 2,376 permits issued by mail for the Chicago Mill. No permanent check stations were set up; however, spot checks were made at various times during the hunts. These spot checks showed a good kill during the first week-end and then both hunting pressure and hunter kill began to decline. The lack of interest probably resulted from the drought conditions that existed. Many of the would-be squirrel hunters were busy harvesting crops. Also, with these dry conditions, the woods were anything but optimum for squirrel hunting. This, plus the fact that there was an abundance of various types of mast present on the area resulted in a wider distribution of squirrels and probably took greater hunter effort to make a kill.

Turkey—The first turkey hunt was held on Chicago Mill G.M.A. between April 8 and 16, 1961. There were 1,300 permits and approximately 26 birds killed on the G.M.A. The weather was the most detrimental factor affecting the 1961 season. The temperature dropped to 37 degrees on several mornings during the season. On cool mornings such as these "Ole Tom" is less likely to gobble or be as active as he normally is with warmer temperatures.

C. E. Forrest and H. E. Eubanks of Tallulah with gobbler bagged on Sharky Road.

Deer—This area was open for five-days of buck hunting only, from November 24 through November 28, 1961. During the five-day hunt there were 5182 hunting efforts made and a total of 259 deer killed.

The use of the Chicago Mill and Lumber Company's private roads greatly influenced the deer kill by providing a means of getting hunters on the G.M.A. However, there has not been enough parking area to accommodate the desired number of hunters in the past years. Therefore during the past year additional parking facilities have been constructed around oil battery tank and other strategic locations on the area. Approximately $800 has been spent constructing additional parking areas on the Chicago Mill Game Management Area.

Gobbler bagged on Chicago Mill G.M.A. during 1961 season.

DEER TRAPPING—MADISON PARISH

R. T. WILLIAMS
Area Supervisor

A small scale deer trapping operation has been conducted on the Chicago Mill Game Management Area No. 2 for the past two years. The trapping operation has been minimized each year for the past several years. A total of 43 deer were trapped during the two year period. Of this number 16 were tagged and released at trap site for movement studies; 23 were used for restocking purposes and 4 died of injuries.

The old wooden box type trap was used for the most part; however, during the past trapping season a considerable amount of time was spent experimenting with a deer snare. A snare device was used rather successfully by the California Department of Fish and Game. The California snare was modified in several details by district personnel and used to some success. Nine deer were snared using the device; however, two deer died from injuries received in the snaring operation. This snare will be further modified and it is believed it can be used successfully in future trapping programs.

Due to the increase in the number of managed hunts and development projects on the area a new overnight cabin has been constructed to accommodate personnel assisting with these projects.

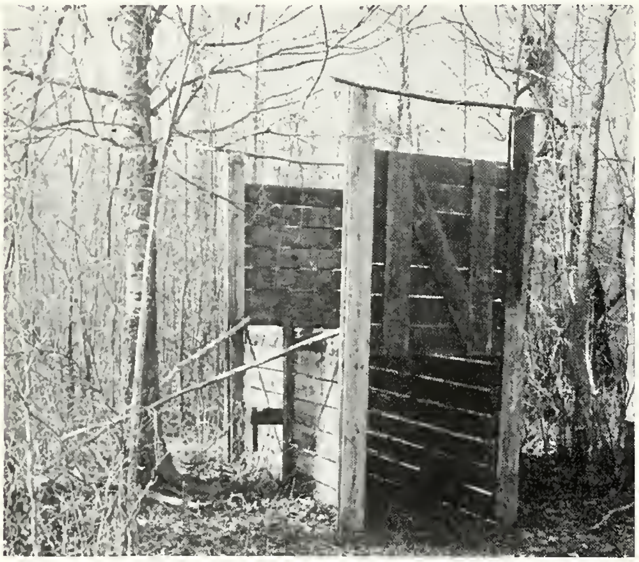
Sixty-five miles of new boundary was brushed out with D-6 and D-7 caterpillar around the Franklin Parish portion of the area. This boundary was painted and boundary markers placed at various intervals around this area. Approximately 21 miles of boundary line between Cooter Point and Tensas River Bridge was brushed out on the Tensas portion of the area. On the Madison Parish portion of the area refuge boundary and entrance markers were raplaced with area boundary markers and area entrance markers along 130 miles of line during the past year.

New Equipment—A ramsey power winch for the 1960 Willys Jeep Truck assigned to R. T. Williams, Refuge Supervisor was replaced during the past year.

Weighing deer

Aging deer.

Tagging deer for information on movement.



Box type trap used to catch deer.

Removing deer from trap to transfer crate.

Food Plots on LaSalle Quail Area

LaSALLE QUAIL DEVELOPMENT AREA

The LaSalle Quail Development Area is located approximately three and one-half miles north of Jena, Louisiana. This project was set up in 1955 on lands owned by the Bodcaw Company.

Twenty-five food plots were established and various types of quail food plants have been planted on this area. This area is open to the public and is used by hunters from various parts of the state.

For the past several years we have experimented with many types of seeds hoping to find one that will meet all or most of the desirable characteristics of a quail food plant. Thus far no one plant has been found that answers all our problems.

It was found that goat-weed and common lespedeza probably comes nearer to filling the bill than any other seed. However, it was also found that it is almost impossible to get any goat-weed seed. For our experimental planting we gathered goat-weed seed by cutting and threshing and combining; however, due to the extensive variability of germination rates of different lots of seeds, time spent collecting seed, etc. proved this to be economically unsound.

In 1960 the plots were planted with common lespedeza. In 1961 these plots were mowed to control competing vegetation. Future development on this area will consist of mowing and fertilizing these plots annually. Also, in some instances it may become necessary to thoroughly prepare the soil and replant periodically.

CALDWELL GAME MANAGEMENT AREA

WELCH LIVELY

Area Manager

The Game Management Area range has been open for cattle, hogs and goats since its existence The animals have depleted the range to the extent that the deer herd on the area has stabilized at a very low level. As evidenced by deer browse study plots and field observations, this is one of the most seriously depleted deer ranges.

The Bobcaw (Nebo) Land Company has fenced 4,200 acres of the G.M.A. against cattle. The fence was completed in April, 1961 and cattle have been removed from the fenced area. It is believed that this area will be transformed into one of the best deer ranges in northeast Louisiana within the next few years. As has been observed from fenced study plots, dense growths of hardwood reproduction and herbaceous vegetation should occur within the 4,200 acre fenced area. Rapid increases in wildlife populations should follow the renewed growths of food and cover.

In 1960 there was a managed squirrel hunt conducted on the area. The area was opened during the first nine days of the regular season. This hunt opened October 1 and ended October 9 with hunting permitted until noon. The hunt was for still hunting only and the following table shows the daily hunting success of this managed hunt:

CALDWELL G.M.A. (1960)

Date	*Hunting Efforts*	*Squirrels Killed*		*Total Kill*	*Avg. Kill Per Hunting Effort*
		Fox	*Gray*		
10-1-60	72	160	. . .	160	2.22
10-2-60	36	107	. . .	107	2.97
10-3-60	13	47	. . .	47	3.62
10-4-60	16	36	. . .	36	2.25
10-5-60	11	32	. . .	32	2.91
10-6-60	16	33	. . .	33	2.06
10-7-60	7	17	. . .	17	2.43
10-8-60	33	33	. . .	33	1.00
10-9-60	14	38	. . .	38	2.71
Total	218	503	. . .	503	2.31

No deer hunt was held on the area during the 1960 season.

In 1961 the area was opened for squirrels from October 7 through October 28, 1961. Persons desiring to hunt the area made application to the District Office. Permits were mailed to the applicants which were valid for the entire season on the area. There were 278 permits issued from the Ferriday office for the Caldwell G.M.A. No permanent check stations were set up however spot checks revealed that the success was only mediocre on the area.

This area was opened for five days of buck hunting only from November 24 through November 28, 1961. During the five day hunt there were 365 hunting efforts made and a total of 21 deer killed.

MISCELLANEOUS ACTIVITIES

The existing food plots were mowed regularly, and fences repaired where needed.

Boundary markers were replaced and boundary lines repainted where needed. Boundary lines were established around property not included in new game management area lease. Brushing and clearing of old jeep roads required periodic attention due to the water fluctuation over much of the area. The old roads were cleared periodically during the past year.

The overnight cabin was moved to a more desirable location. Repairs have been made to the overnight cabin and both the exterior and interior have been repainted.

DISTRICT V

JACK A. SIMS

District Supervisor

DeRidder Airport Public Hunting Area

This is an area of approximately 800 acres located on the DeRidder Airport four miles west of DeRidder, La. The land is owned by the Beauregard Parish Police Jury and is under lease to the Louisiana Wild Life and Fisheries Commission for use as a public hunting area.

The area has nine food plots totaling approximately twelve acres which are planted annually. Since the area is most suitable for quail and dove, the plots are planted to brown-top millet. Rabbit is another species which is fairly abundant on the area, but no development is done to supplement the rabbit population

The DeRidder Airport Public Hunting Area is open during the entire legal season and hunters are permitted to enter and leave at will. No special permit is required for hunting on this area. Even though this area is relatively small, it is an important one because of its location and accessibility.

Gum Cove Black Francolin Release Area

The first shipment of Black Francolins to the State was received on April 5, 1961 and housed in the holding pens at Gum Cove in Cameron Parish.

Black francolins like to perch atop posts.

The birds were held in the conditioning pens until April 17 when approximately one-half of the birds was released. On April 19 the remainder was released. A total of 110 birds was released. Of this total 69 were males and 41 were females. This release site is approximately 24,000 acres in size and is of the coastal prairie type.

Numerous checks were made on the area during the year by Commission personnel. During these trips to the area, records were kept on the number of birds seen and heard calling.

Employees on the ranch where the birds were released have reported seeing at least four broods of young birds. These reports are probably accurate because Commission personnel have observed calling males consistently in the same area which would indicate that breeding ranges had been established.

The need for the attempt to establish this bird and the results thus far obtained will be discussed in more detail under another section of this report.

WEST BAY GAME MANAGEMENT AREA

E. E. GARLINGTON

Area Supervisor

During the period covered by this report, the size of the West Bay Game Management Area was increased from 18,500 acres to approximately 58,000 acres. The annexation involved five major land owners, which were the principal owners of the original 18,500 acre area. Land owned by several individuals was also included in this annexation. Since the size of the area has been increased, the hunters of Louisiana can be assured of increased hunting opportunities in the future.

FOOD PLOTS—There are seven food plots on the Area totaling approximately 35 acres. These plots are fenced with net wire since livestock is allowed free range on the Area. The plots are planted primarily for the turkey on the Area. Alternate strips are planted in the plots with idle strips being left for cover. Five of the plots have permanent strips of Bahia grass established on them. This is the only perennial plant used, with the remainder of the strips being planted to Brown-top millet throughout the spring and summer and then planted to wheat, oats and rye grass during the winter for green forage.

CAMPING AREAS—There are now three overnight camping areas on the Game Management Area. These areas are fenced against livestock and have deep wells and sanitary facilities available. The camping areas are so located as to allow hunters to use them both during the managed hunts and also during the hunting season outside the area. These camping areas are also available for use during the summer or at times when the hunting seasons are closed. The camping areas received much use during the past hunting season.

TURKEY POPULATIONS—Game farm turkeys were released on the Game Management Area during 1949 and 1950 in an effort to establish a turkey population. At the time of these releases, there were no native turkey on the Area. During the spring of 1960 there were 36 stations established to listen for gobbling turkeys. From this number of stations 38 turkeys were heard gobbling. During the spring of 1961, 38 turkeys were heard from 28 listening stations. From the above information and sight records of young birds, it seems that the turkey population is increasing on the Game Management Area.

SQUIRREL—Managed squirrel hunts were conducted on the area during the 1960-61 and 1961-62 seasons. The season during 1960-61 was nine days in length with hunting terminating at noon each day. The season during 1961-62 was 21 days in length and hunting was terminated daily at 5:00 p.m. Daily permits were required during both hunts. The table below contains the information on the hunts:

		Squirrels Bagged		
Date	*Hunting Efforts*	*Fox*	*Gray*	*Total*
10-1-60—10- 9-60	2,448	251	4,661	4,912
10-7-61—10-27-61	4,454	1,597	8,498	10,095

ARCHERY SEASON—A special archery season was allowed on the Game Management Area during the seasons of 1960-61 and 1961-62. Archers were allowed to take deer and any other game species which was in season. The archer was required to secure a special archery permit which was good for the entire season and was not required to check in or out of the Area every day as was the gun hunter. Personnel of the Commission were on the Game Management Area during the hunt and checked hunters for permits when they were encountered.

The hunt during the 1960-61 season was 15 days in length and confined to Friday, Saturday and Sunday only beginning October 21, 1960. The 1961-62 season was 16 consecutive days beginning October 28. Since the hunters were not required to check in or out, there is no way of knowing how many hunting efforts were made. The deer kill as determined by the area supervisor was three during the 1960-61 season and ten during the 1961-62 season.

DEER—A five day managed deer hunt was conducted on the area during the 1960-61 and 1961-62 seasons. The hunters were admitted to the Area on a daily permit basis. Four permit stations were operated at strategic locations, thus causing the hunter as little delay as possible in securing his daily permit. Each hunter that was successful in bagging a deer was required to take his deer to one of the two weighing stations on the Area so that certain facts pertaining to his deer could be recorded and thus used in better managing the deer herd in future years. Some of the information secured was weight, age, number of points on the antlers and other such data.

On the last day of both the 1960-61 and 1961-62 seasons the hunter was allowed to kill either sex deer. Spotted fawns were not legal. This was done in order to reduce the deer herd and better manage it according to the available range.

The following table shows the number of hunting efforts and hunters' success for the two years.

Date	*Permits Issued*	*Deer Killed*
Nov. 24-27, 1960 (Bucks only)	3,604	87
Nov. 28, 1960 (Bucks and does)	2,165	192
Total	5,769	279
Nov. 24-27, 1961 (Bucks only)	5,143	135
Nov. 28, 1961 (Bucks and does)	2,500	320
Total	7,643	455

Following hunt, squirrels from Game Management Area are checked by biologist of Wild Life and Fisheries Commission.

DISTRICT VI

J. B. KIDD

District Supervisor

W. A. GOUDEAU

Biological Aide

Thistlethwaite Public Hunting Area Squirrel Hunts

Managed squirrel hunts were conducted on the Thistlethwaite area for the third and fourth consecutive years during the 1960 and 1961 seasons.

Hunters in 1960 enjoyed the best hunting success and highest total kill of all years hunted—1958-1961. During 1960 the area was opened for 16 half days, October 1-16, with hunting being halted each day at 12 noon. Hunters exchanged their licenses for daily permits and reported back to the permit station to have their squirrels examined. This 16 day hunt resulted in killing 5776 squirrels. There was a total of 2099 individual hunts made on the area for an average kill of 2.75 squirrels.

In 1961 the area was opened for the same number of days as 1960. The opening date was one week later, October 7, and again all hunting was halted at 12 noon and daily permits required. During the hunting period, October 7-22, 4376 squirrels were killed for an average kill per hunting effort of 2.40 squirrels. In 1961 the smallest number of hunters for all four years, 1958-61, turned out for the hunt. There was a total of 1819 hunts made in 1961 which was 280 less hunts than 1960, 306 less than 1959 and 1041 less than the opening year of 1958.

Although individual hunter success in 1961 was .3 of a squirrel less than 1960, it is believed that the squirrel population is at the same level as it was in 1960.

Hunting conditions in 1961 were unfavorable for the best squirrel hunting. The woods were very dry when the season opened and this condition continued through the entire hunt as no rain at all fell during the 16 days that the area was hunted. This dry condition and some very windy mornings no doubt lowered hunting success.

The mast production of 1961 is the best since the area has been hunted. This should result in good squirrel reproduction and another good hunting year on the area in 1962.

A COMPARISON OF HUNTER SUCCESS 1958-1959 1960-1961

Year	*No. Hunts Made*	*Fox*	*Gray*	*Un-known*	*Avg. Kill Per Hunting Effort*
1958	2,860	562	5,020	7	1.95
1959	2,125	456	4,725	14	2.45
1960	2,099	646	5,127	3	2.75
1961	1,819	539	3,836	1	2.40

Deer Restocking

Since this area was completely void of deer, a restocking program was instituted in 1961 with the intent of building up a herd that could be hunted in the near future. During the early spring and summer of 1961, 14 deer were released on the area that were trapped in Madison Parish. It is intended to release more deer on the area in 1962 until an adequate stocking has been made.

DISTRICT VII

HENRY D. ROBERTS

District Supervisor

TOMMY CHATHAM

District Biologist

SUPPLEMENTAL QUAIL FOOD PLANTINGS ON PUBLIC ACCESS LANDS

This is a continuation of a project initiated in the spring of 1957, in cooperation with the Gaylord Container Corporation (a subsidiary of the Crown-Zellerbach Corporation). Lespedeza bicolor strips were established on most of these plots (on approximately half of each plot). Brown top millet, soy beans, and iron clay peas have been planted on a portion of each plot, while the remainder of each was left as a "rough" for nesting and escape cover. Also, Kobe lespedeza was broadcast throughout the bicolor strips, and has reseeded itself quite successfully for the past two years; however, it and the brown top millet must have drowned during the exceedingly wet spring and summer which we have just experienced. There is very little evidence of either plant, at present. The iron clay peas produced good stands of vines, but only "poor to fair" seed crops. In February and March of both 1960 and '61, the bicolor plants were clipped back to within 5 inches of the ground. The heavy sprouting caused by this created a good thick cover. In 1960 it produced a good seed crop, and in 1961 there was an excellent seed production.

ZEMURRAY DEER MANAGEMENT AREA

FRED JOINER

Area Supervisor

TRAPPING

There has been no effort made to trap deer on this area through the trapping seasons of 1960 or 1961, due to the fact that the managed hunts have reduced the deer population to the point that they practically ignore bait put out for them. Also, the roads are usually left in such poor condition, after the hunt, that it would be practically impossible to carry out a trapping operation.

CONTROLLED HUNTING

Controlled deer hunts were held on this area on January 4, 5, 6, 1960, and again on December 6, 7, 8, 1960, for both bucks and does. In January 150 hunters per day were allowed on the area for each of the three days. The resulting kill was 113, of which there were 50 bucks and 63 does. These ranged in age from 6 months to 10½ years. Weights on these ranged from 28 lbs. to 125 lbs. (live weight).

The next season's hunt, held December 6, 7, 8, 1960, allowed only 100 hunters per day (hunters were too closely crowded during the previous hunt, when 150 per day were allowed). A kill of 50 deer resulted; this consisted of 22 bucks and 28 does. Live weights on these ranged from 30 lbs. to 135 lbs.

RANGE CONDITIONS

The badly overbrowsed range, during the 1960 season (Dec.) had shown very little or no manifestations of recovery, in spite of the heavy deer removal during the previous season (140 deer taken from 5500 acres). At present the range is showing a marked rate of recovery. Even the yaupon and greenbriar are becoming fairly abundant, where as prior to these hunts scarcely a sprig of either could be found within reach of a deer.

IMPROVEMENTS ON THE AREA

Approximately half of the road around the area was widened and the brush and some of the timber was cleared along the sides in order to allow sunlight and wind to more rapidly dry the roads after rains. Also, approximately 150 cubic yards of gravel was applied to the places where needed most.

DEER RELEASES IN DISTRICT VII

During the trapping season in the early part of 1960, a deer release site in Washington Parish was approved, and the release was begun. Seven deer were released in this area (Mt. Hermon release site) before trapping was discontinued for the season. The trapping season during the early part of 1961 was very poor; consequently, very few deer were caught, and these few were released elsewhere. Probably this release will be completed this coming season.

Another release, known as the Montpelier release (on the St. Helena—Livingston Parish line), was completed during the 1959-1960 trapping season. This release and its resulting herd seem to be doing quite well, in spite of numerous reports of "deer outlawing" within it.

The Fluker's Bluff release, just east of the Amite River in the northwest corner of St. Helena Parish, has had six fawning seasons on it. This has produced a nice herd of deer, even though they scattered far and wide when released (even up into Mississippi). A release was made just west of the Amite River, in the southeast corner of East Feliciana Parish, and is called the Bluff Creek release. This one has had five fawning seasons, and has done quite well. These two releases and their resultant herds will provide still-hunting (for bucks, only) for a great number of hunters this season, 1961.

BEAVER TRAPPING

LLOYD CUTRER

Trapper

This work is carried on continually in an effort to alleviate complaints of timber damage due to flooding and feeding habits, crop damage due to feeding habits, and just general complaints about them. For this work both Bailey live traps and Victor Conibear traps are used. Beaver taken by live traps in the vicinity of Baton Rouge are turned over to the Louisiana State University Veterinary Science Lab. for use by them.

Quite often it is more expedient and more effective to blow the beaver dams out with dynamite, rather than try to trap them.

Beavers flooded 80 acres of young hardwood, including some pine. This flooding resulted in the killing of this timber.

Remains of a beaver dam releasing water after the dam was blown by dynamite. Immediate destruction of beaver dams by landowners would prevent the loss of timber stands due to flooding.

Generally the property damage by them is relatively slight, but damage to the proprietors feelings is quite often immense! Occasionally, however, several acres may be flooded, causing extensive property damage. One such instance is near Clinton, where some 20 acres were flooded; another example of severe damage is an 80 acre lake which killed 80 acres of timber, just by construction of a dam approximately 1/8 mile in length and 3 feet high. This is near Indian Mound, 15 miles or so northeast of Baton Rouge.

DISTRICT VIII

ROBERT A. BETER

District Supervisor

JERRY FARRAR

Biologist

PUBLIC SHOOTING GROUNDS

District VIII activities during the prior two years of this biennium were comprised of development operations on two marshland public shooting grounds. A total of approximately

70,000 acres is in the process of intensive development under the auspices of the Pittman-Robertson Section, Fish and Game Division. The Biloxi Marshlands Public Shooting Ground, comprising 40,000 acres, is the largest of the two areas. Although the 30,000 acre Wisner Public Shooting Ground is somewhat smaller in acreage, it also offers splendid development opportunities.

Considering the extreme diversity of location, vegetation and development aspects, these two waterfowl areas shall be treated as separate entities.

WISNER PUBLIC SHOOTING GROUNDS
PROJECT W-31-D

This public shooting ground has been active since May 11, 1958. The 30,000 acre tract of potentially good waterfowl land is leased from the Edward Wisner Foundation for a period of 10 years with a 5 year option to renew. It is located in the southeast portion of Lafourche Parish between Leeville and Grand Isle, La.

Boundaries start at the Southwest Louisiana Canal on the north, Gulf of Mexico on the south, Caminada Bay on the east and Bayou Lafourche on the west.

Actual physical developments began on this marshland during 1959. During the interim period, a total of 11 wooden structures have been erected on the area. These 11 structures stabilize levels in approximately 8,200 acres of marshland. Water depths in bayous in which wooden structures are placed range in depth from 5 to 8 feet.

Due to the disposition of the marsh with the interlacing labyrinth of connecting bayous, ditches and lagoons it becomes necessary to construct numerous earthen levees in conjunction with the wooden weirs. The smaller ditches and deteriorated spoil banks along bayous are therefore closed by earthen fills.

All construction work was done with the normal complement of boat captain, dragline operator and dragline operator helper. Three temporary laborers are found to provide the most conducive and practical arrangement feasible in actual dam building.

The best procedure was to prefabricate, into triple sections, the vertical sheeting of 2″ x 8″ x 14′ and then load this and the necessary pole pilings onto the dragline barge to complete one structure. All materials were handled by the dragline. While the dragline was being towed to the dam site the laborers were taken by outboard boat to location to begin clearing brush and other obstacles and to stake the exact location of the dam, under the supervision of the assistant project leader. Upon arrival of dragline, all materials were taken from the barge and deposited in equated amounts on both sides of the bayou. Subsequently, pilings were driven for this particular structure. After this phase of the operation the installation of horizontal upper and lower walers was completed. The third step of the operation requires a falling tide for completion. The driving of the vertical sheeting can only be accomplished when water is falling from the inside toward the outside of the structure.

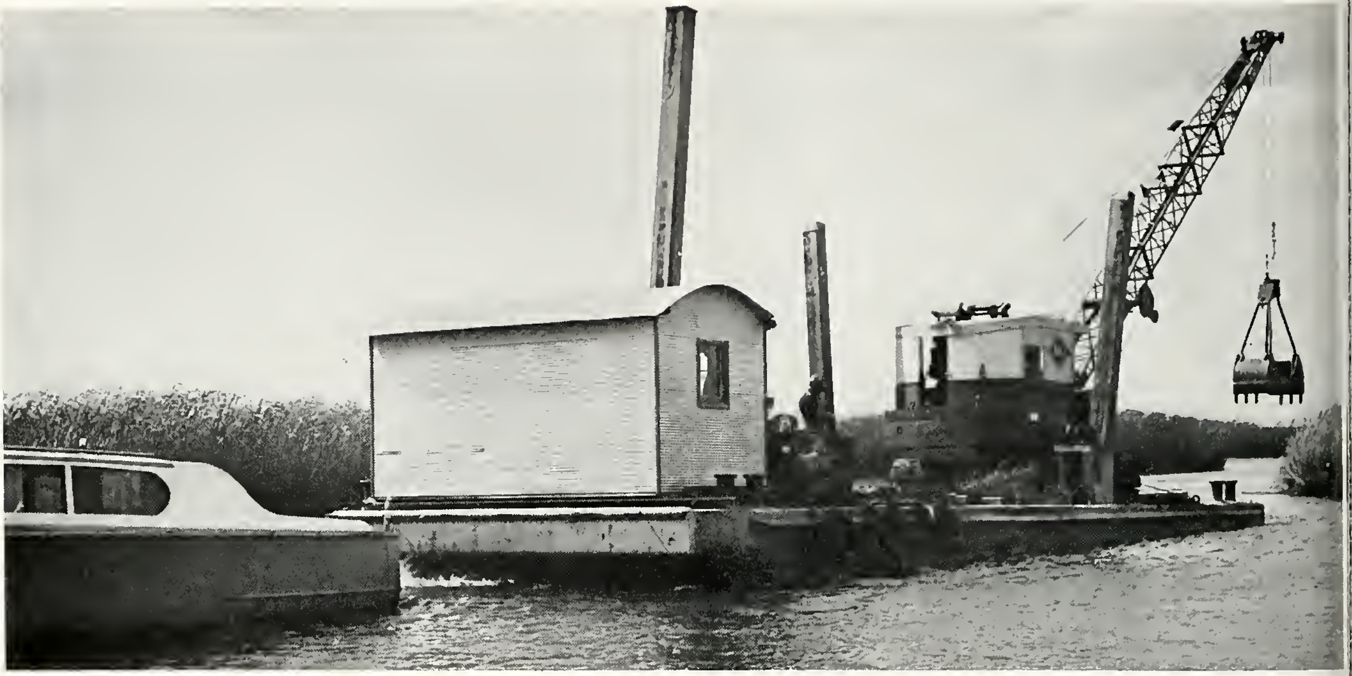
Close up of finished structure at low tide.

Such a phenomenon, falling tide, holds the sheeting flush against the back side of the horizontal walers. Conversely, if the tide is rising the vertical sheeting is pushed away from the walers and cannot be driven straight and tight. This one condition governs the length of time needed to complete a structure. If tides rise all day and fall at night, then it becomes necessary to shift operations to another locale. By moving to another location it is possible to drive pole pilings and install horizontal walers. Then when tidal conditions have improved the barge returns to the original site. By starting construction in the center of a bayou and completing work toward one bank and then shifting from center toward the opposite bank, the operation can then proceed without abatement, as tidal movements do not now present a problem. The lateral extensions into the bank can now proceed swiftly.

Water depth in excess of 16 inches over the pre-set height of the structure does not present a hindrance to installation if clarity is prevalent and tides are at ebb flow.

After completion of the structure a 3½ foot protuberance of 2″ x 8″ lumber is attached perpendicular 10″ below the top of the dam from bank to bank to serve as an apron or splash rail. Such a device prevents the outfall of water from washing a hole or undermining the outside of the structure. As the water on the inside always remains at a fixed minimum, no attachment such as this is needed there.

When the dam is thus completed the dragline



Dragline being towed through marsh canal for duty in public shooting area developed by Wild Life and Fisheries Commission.

is used to backfill and levee the laterals. The laborers are sent back to camp to complete the building of enough materials for completion of another structure. Then the operation is repeated.

In certain portions of the area it has become a necessity to reconstruct the deteriorated spoil levees created by oil and gas companies in their past endeavor of exploration and development practices.

Without constant vigilance and restoration and maintenance, the function of wooden structures would be defeated by allowing loss of waters through new canals dug by oil company development, channels created by marsh buggies and seismographic operations.

Vegetative types on the Wisner tract consist almost exclusively of the climax species of oyster grass. Controlled burning in some instances will revert this climax back to the sub-climax of leafy three-square and Olney three-square. Submerged aquatics consist of widgeon grass almost exclusively.

Each year a new segment of the marsh is designated for development through the use of aerial photographs. After determination of the acreage to be developed by use of aerial photos, an on-site inspection is used to determine depths and widths of bayous, ditches, and lagoons to be closed. Then soil borings are made across these same openings to ascertain suitability of soil type and texture and also whether or not shells or old stumps would negate installation of wooden pilings. If such conditions are encountered then a new location is plotted and procedures repeated.

After field inspections are complete and deemed satisfactory, then tabulations of materials, cost and personnel needed are computed and documented for final approval. Detailed work plans are also submitted with respect to approximate man days needed, construction and procedures to be followed.

All development operations are scheduled to be done on the Wisner tract during the winter and spring months. This is necessary due to the area being conducive to inside movements of dragline and barge without having to go into open water of large lakes during winter "northers" such as is necessary on the Biloxi Public Shooting Grounds. Such a condition permits the working in six month segments on each area and during conducive weather conditions on both.

By courtesy of the Lafourche Parish Police Jury, three shelled boat launching areas were installed and maintained adjacent to the area. The first site is located on the west side of Hwy. 1, near Bayou Moreau, about seven miles south of Leeville. The second launching area is located on the south side of the same highway at Dos Gris, Louisiana, about 15 miles south of Leeville. The third public launching area is located on the north side of Hwy. 1, adjacent to Bayou Fer Blanc.

BILOXI MARSHLANDS PUBLIC SHOOTING GROUNDS PROJECT W-33-D

This area comprising 40,000 acres of good waterfowl area along coastal Louisiana, was acquired October 1, 1958.

The marsh area lies approximately 30 miles southeast of New Orleans in St. Bernard Parish. The tract is bounded on the north by Lake

Borgne, on the east by a zig-zag line starting from Lake Borgne, approximately half a mile east of Bayou Hasouse and running south to the north side of Bayou Loutre, on a quarter mile east of Engineer's Canal, thence along Bayou Loutre to a point three-quarters of a mile north of Issac's Ditch, thence east to a point one and one-half miles northwest of Crooked Bayou, thence north through Lake Eugenie and Bob's Lake, west through Lakes of Bayou Marron, and thence northeast to Lake Borgne and terminating at a point approximately one-quarter mile south of Bayou LaFee.

This public shooting ground is accessible from almost any direction. Access points are as close as Shell Beach, Ysckloskey and Hopedale. Larger boats take the more direct route south across Lake Borgne from Chef Menteur and the Rigolets.

The interior marsh is a labyrinth of bayous, lagoons, ditches and ponds. Nearly every pond and lagoon has an abundance of aquatics such as widgeongrass, southern naiid, and coontail Diving ducks and puddle ducks (scaup, mallards, teal, gadwalls and baldpate) come into the myriad of ponds to feed. Upon the shores and marsh proper come thousands of blue and snow geese to feed upon the new shoots of three-cornered grass following burning procedures.

Impoundment created by simple earthen levee thrown up by dragline.

Isolated ridges which now lie dormant stand as mute testimony of the old distributary of the Mississippi River, Bayou Loutre. Upon these ridges rabbits, deer and the ever present cottonmouth occur.

Salt water fishes such as speckled trout, redfish, sheephead, etc. are abundant in the waters of this area as are freshwater fishes such as redear and bluegill sunfish and some black bass. The area is heavily utilized by sport fishermen throughout the year. Particular emphasis is now placed on fishing around the recently completed structures. Successes have been phenomenal on all species of salt water fish.

Actual physical developments commenced in January of 1960. A total of 14 wooden structures were installed during the prior biennium. In addition two small manually installed structures were erected. These installations now govern 3,900 acres of controlled developments.

Earthen fills coupled with wooden structures will tend to stabilize water levels throughout the whole of the developed area. Stabilized water levels should insure the annual production of submerged aquatics such as widgeongrass. Also, stabilized water levels will provide better access during winter months when northwest winds usually blow practically all the water from ponds and lagoons.

Hurricanes off the Louisiana coast during 1960 and 1961 resulted only in delays of operations as it was necessary to move personnel and equipment to safe harbors for the duration of the hurricane warning.

No physical damage was incurred on either the Biloxi or Wisner area during the storm periods.

Controlled burning of the marsh will reduce the climax vegetation of wire grass, the big cord grass, and oyster grass. Growths of sub-climax vegetation of three-cornered grass and leafy three-square, which are favored by geese and muskrats, should result.

The waterfowl seasons saw development operations well under way and more hunters and fishermen taking advantage of the hunting and fishing opportunities with undeniable proof of successes.

No restrictive measures such as permits, number of hunters, etc., are required as prerequisites to hunting or fishing on either the Biloxi or Wisner Public Shooting Grounds.

BOHEMIA SPILLWAY PUBLIC SHOOTING GROUNDS

A biological reconnaissance has been conducted and recommendations and suggestions submitted regarding this potential public shooting ground. A total of approximately 33,000 acres, located in Plaquemines Parish on the east side of the Mississippi River between Bohemia and Ostrica are involved. The Louisiana Wild Life and Fisheries Commission has taken under advisement this offer from the Orleans Levee Board.

Potential for deer, rabbit and rail hunting is excellent on portions of this area. Diving ducks in the large bays and lagoons and dabbling ducks in the interior marsh would provide a boon to hunters.

Although these public shooting grounds are serving the purpose for which they were designed, they are only stop-gaps as both the Biloxi and Wisner areas are on a lease basis. There could come a day when these leases could be cancelled or not renewed. These are finite and valid conditions to stimulate and achieve the realistic goal of purchasing areas to be used as public shooting grounds. Only by purchase, ownership, and rigid regulatory stipulations on oil and gas explorations and development can the hunting and fishing conditions be perpetuated in the Louisiana marshlands.

Research

ROBERT E. MURRY
Leader

INTRODUCTION

Heartening progress is being made in wildlife management in Louisiana. Two significant impediments to progress are being slowly neutralized and the rate of speed with which we move towards sound management is being increased.

One of these barriers to progress has been, and still is, our own lack of knowledge. Although staffed by professionally trained wildlife biologists the Fish and Game Division has been unable to hire personnel with accurate answers to all of Louisiana's many different wildlife problems. The reason for this is that such people do not exist anywhere on the face of the globe.

The relatively new science of wildlife management has made much progress in Louisiana and elsewhere in the recent past, but a great deal more knowledge is necessary to assure continued progress in the management of one of our most important renewable natural resources. This knowledge is obtained by deliberate research properly planned and conducted.

The second barrier, and possibly the most serious at the present, is the reluctance on the part of the hunting public to accept some of the primary concepts of good game management. Opposition on the part of the public has been most evident where deer management is concerned. Much of this opposition stems from the fact that present regulations are different from those of a few years ago. Changes which are essential to better management may be readily understood by the professional game man and the administrators of the wildlife program, but meet with such disfavor from the general public that they cannot be made. Although we are frequently impatient at the slow rate of change in public thinking regarding deer management we cannot deny that we are making progress.

Hunting game management areas is much less controversial today than it was a few years ago, although there is still some opposition to either sex deer seasons. One of the reasons for the change in thinking regarding management area hunting is undoubtedly the fact that those people who hunt them year after year deeply appreciate the hunting opportunity afforded them. Another reason is the large volume of factual data gathered from these hunts. These data have been used in various publications and have been drawn heavily upon as a source of information for wildlife lectures. The collection and compilation of this information has been one of the responsibilities of the research personnel of this Division.

Several examples of changes in regulations are available for closer examination. From these, three are selected and discussed below:

Example 1

ECONOMIC VALUE OF HARVESTED DEER

This example is taken from the Red Dirt Game Management Area where our first managed deer hunt was held in 1955. From that date to the present a great deal of data is available. We will use only the total legal kill by years in this discussion.

Bucks only Hunting	*Either Sex Hunting*
1955—90	1959—337
1956—0	1960—174
1957—86	1961—140
1958—47	Total 651
Total 223	

Under either sex harvest 651 deer were taken in three years. During the four years prior to that time three bucks only seasons resulted in a harvest of only 223 legal deer. Now if we take the commonly accepted figure of $140 as the average cost to bag a deer and call this the worth of a legally bagged deer; we can come up with a dollar value of the deer taken from this area.

The total worth, at $140 per head, for the seven year period was $122,360. Of this sum only $31,220 worth was accumulated during the first four years of the period and $91,140 worth of the harvest occurred during the past three seasons when either sex deer were legally taken.

Here we can see that a change in regulations has resulted in an increase in kill from an average of 56 per year the first four years to an average of 225 per year for the next three years. Still using our $140 per head yardstick we can compute the difference at $23,600 per year.

We never expect to go back to bucks only harvest on Red Dirt.

Example 2

CATAHOULA GMA HUNTER SUCCESS DATA 1959-60

This example comes from an area where widespread public opposition following the 1959 season on bucks and does, resulted in a change to a three day bucks only season. Many statements were made regarding the "annihilation" of the deer herd following the kill of 355 deer in 1959. The Commission's position has been to stand for proper management of deer herds but at the same time they are aware that the deer herd belongs to the people. No group of people came forth between the 1959 season and the setting of the 1960 season to state to the Commission that they favored letting this agency regulate deer hunting as they saw fit. On the contrary many individuals and groups protested the killing of the deer in 1959 and urged a completely closed season for one or more years.

A post season range survey indicated that either sex harvest was feasible but armed only with a few sheets of biological data the Commission was powerless to confront the large group of people who at that time demanded that a change be made.

The results of the three day buck hunt are compared to the first three days of the 1959 season since during this period bucks were the only legal game also. During the first three days of 1959 it took 23 hunting efforts to kill a legal buck. During the 1960 season hunter success remained virtually unchanged although slightly better and it took 22 efforts to bag each buck.

Local people, keenly interested in the welfare of this deer herd; closely observed the results of the 1960 hunt. Many of these people have become convinced that the legal harvest is a tool of management which should not be neglected or approached from an emotional standpoint.

We expect the legal harvest of deer each year from the Catahoula Game Management Area to include at least one day or either sex harvest. More people insist on proper management now than did a few years back.

Example 3
HUNTER SUCCESS—BUCKS ONLY—CHICAGO-MILL GMA 1960 and 1961

The Chicago-Mill GMA supports a good deer herd and is capable of providing sport for a great many Louisiana hunters annually. During the 1960 season more than nine thousand deer hunting efforts were made on this area. Many people became alarmed at the total kill of 739 deer and went to work to get the seasons changed. The common charge leveled at the Commission was that the deer herd had been "exterminated". Although these people were sincere in their beliefs, and had the interest of the deer herd at heart, the Commission was hearing essentially the same thing they had heard following the 1959 season on Catahoula.

Specimen killed on Chicago Mill during 1960 season.

Surveys of the area indicated a capacity deer herd from which both sexes could and should be taken during the 1961 season. Public pressures prevented this and the Commission reluctantly opened the area to only a five day "bucks only" season.

The results of the 1961 hunt is of interest since this hunt occurred in an area where the herd was "wiped out" in 1960.

A valid comparison seems to be had by using the first four days of the 1960 hunt when only bucks were legal to compare to the first four of the five day 1961 season.

In 1960, 6123 hunters killed 237 bucks during the first four days. In 1961 this period of time saw 4666 hunters take 243 bucks. The hunter success rate of 1960 was one deer per 26 hunting efforts and in 1961 it was one per 19 efforts.

It is extremely difficult to accept the contention that the 1960 season was detrimental to the Chicago-Mill GMA deer herd. The Wild Life and Fisheries Commission strongly supports the belief that the 1960 season not only *helped* the deer herd on this area but provided over 4,000 more man days of very valuable deer hunting recreation than did the curtailed season in November of 1961.

The preceding three examples are used only to show some of the value of a written record of events for further examination and study. The seasons on game management areas are not set for the purpose of gathering information. They are set to provide hunting recreation. The records are kept since they represent a valuable source of hunting pressure and hunter kill from areas of known size. These records have been of much help in exploring some of the unknowns of game management confronting us here in Louisiana.

SPECIAL STUDIES

ROBERT E. MURRY

Project Leader

Several investigations have been conducted which were of relatively short duration and were done by personnel already assigned. For the most part they have required less than full time effort. In two instances these jobs were conducted by graduate students of Louisiana State University.

One study was designed to measure the effects of deer and cattle browsing seedlings of merchantable hardwoods.

Most of the field work was done in Tensas and

Caldwell Parishes making use of deer exclosures paired with control plots of like acreage. In Caldwell the exclosures excluded cattle only. The exclosures on each area had been conducted several years prior to the study by the Fish and Game Division.

In the Tensas study area a heavy removal of deer occurred during the second and third years of exposure of the controls to deer use. Results of stem counts and measurements on the Tensas area did not indicate that deer at the stocking level of the study area did not greatly influence hardwood reproduction.

On the Caldwell study area a heavy cattle population plus a moderate deer herd had greatly impeded reproduction of merchantable species.

This study was completed by Louis P. Heard, Graduate Student, School of Forestry, Louisiana State University, in September of 1960. He was assisted and advised by faculty members of L. S. U. and personnel of this Division.

A job designed to check the rabbit use of some planted winter foods was completed by Graduate Student Robert Croft, also of the L. S. U. School of Forestry. This job measured utilization of four winter annuals planted for rabbits. From this study has come the recommendation that rye grass be further tested since it was much more used than was wheat, vetch or clover planted in the same area for comparison.

The rabbit development under observation is on the Idlewild Experiment Station farm in East Feliciana Parish. It is on a portion of the area reserved for game and forestry research by the L. S. U. School of Forestry.

The prepared strips will be used to further test plants which show promise as rabbit foods.

The first phase of this study was completed in August, 1961.

One job has recently been started as a result of the need to better understand hunter use of management areas. Some of the more recently established management areas operate on the principle of a hunting permit which is good for a full season.

This is in contrast to the established check-in; check-out hunting permits used on older areas. By reducing administrative costs of managing hunts it was possible to offer more liberal seasons.

The Fort Polk Game Management Area, established in 1960, has the same seasons as does the adjacent areas. It is relatively easy to compute the cost of operating such an area and to also evaluate the degree of protection we are able to give it under the liberal rules in force. What has been lacking is a measure of hunter participation and success. The number of season permits is not a valid measure of hunting since a permit holder may hunt several times or none at all.

Mailing addresses of 1961-62 hunting permit applicants were recorded and they were requested to respond to a post-season mail survey to be conducted. The reactivation of Fort Polk and the consequent increase in permit applications has caused us to consider changing our original survey plan. Instead of sending each permit holder a questionnaire at the close of the season it may be possible to reduce the sample size considerably and still get the desired information.

Details of the survey are being worked out by L. W. Soileau who is also Dove Study Leader.

A study of the survival and reproduction of the recently introduced black francolin on the Gum Cove area is one research job and a similar study of the release at Oak Ridge is another under special studies. These are assigned to the district supervisors where the releases have been made.

These studies are reported on in more detail later.

TRANQUILIZER STUDY

Since one of the problems frequently confronting the wildlife manager is the need to capture, handle and sometimes transport wild mammals and wild birds, he is concerned with losses associated with capture and handling. Development of many techniques during the past have reduced losses but they still occur whenever any large number of wild animals must be handled.

Recent work in the United States and Europe with tranquilizers and tranquilizer-like drugs has revealed some room for practical application in the use of these drugs. Notable examples concern the survival of expensive Zoo animals, captured as adults and shipped directly to their new homes. Much work has been done with semi-wild domestic livestock.

A large drug manufacturing concern has made available to the Commission a quanitity of experimental drugs. These drugs are in a form for oral administration and for hypodermic injection. Research to date has been experimental bait feeding of small doses to determine ways of preparing the drugs in bait mixtures to disguise the bitter taste.

It is hoped that a wide range of wild animals and wild birds can be made docile by administration of these substances. Reports from other investigators indicates a very wide safety range. In other words the optimum dose aimed at producing the desirable reaction has been greatly exceeded in many instances and the test animals have survived.

TURKEY RESEARCH

Turkey research is aimed only at evaluating birds used for restocking unoccupied ranges. Since vast acreage of potential wild turkey habitat exists in the state and is, for the most part, presently without any turkey, stocking must be the first step towards any management program.

In the early 1950's a widespread stocking program was undertaken using game farm stock from Pennsylvania. Some releases were made for research purposes on the relatively new game management areas. Other releases were made in unoccupied range to attempt to establish wild turkey populations. Still other releases were made on or adjacent to ranges occupied by native wild turkey.

To the present turkeys are known to survive these original releases in breeding numbers only on and around the West Bay Game Management Area in Allen Parish and in the vicinity of Simpson in Vernon Parish. In neither case have these ranges produced enough turkey to justify a legal harvest. It is impossible to evaluate the results of stocking these part-domestic birds to occupied ranges.

From the occupied ranges in Vernon Parish six birds were trapped in the spring of 1958 and five were trapped in early 1959. These birds were stocked to Red Dirt where an initial stocking of game farm turkey had failed a few years earlier. It was hoped that these trapped birds, after several generations in the wild, would have acquired an ability to prosper on Red Dirt.

In order to better the chances of success of the transplanted turkey an intensive development program was begun. At least one brood of six was reared in 1958 and an unconfirmed report of a late summer brood was received. The brood of six and several of the adults took up a range nearby, and heavily used existing plots. They apparently moved outside the management unit in the fall and overwintered in a stream bottom with a better distribution of mature oaks.

By the time the 1959 release was made turkey sign was again abundant around the plots used the previous summer. Reproduction in 1959 was spectacular with several large broods produced to fall maturity. Turkey sign again became scarce by November but the return to spring and summer range was awaited. By now the developments had been expanded to make a large portion of the area attractive and many of the new plots had a history of use in 1959.

In 1960 birds came back to some of the improvements and again some young were reared, although there seemed to be less young than in 1959. Essentially the same thing occurred in 1961 and the birds again failed to reach the apparent high of the fall of 1959.

Since we were very interested in the results of this stock of birds as a possible source of turkey to restock unoccupied ranges the need was felt for an accurate evaluation of the quality of the turkey. For that reason the turkey study was begun in 1960.

No native wild turkey has ever been available to the Commission to develop huntable flocks in unoccupied ranges. In 1960 it appeared that in cooperation with Louisiana State University a start of native turkey could be obtained from lands of the Idlewild Experiment Farm in East Feliciana Parish for research purposes. The present study plans call for the stocking of these birds to the Bodcau Game Management Area in Bossier and Webster Parishes. Development plots comparable to those on Red Dirt are to be maintained for the turkey. The progress of the population on Red Dirt can then be compared to that of the Bodcau population. As soon as flock size warrants it, turkey can be trapped from either area to partially fill the present need for stocking.

The Idlewild area was baited in the spring of 1961 and turkey use of bait was almost immediate. The birds used bait for several weeks and heavy rains interfered with trap construction. Four permanent traps were constructed in March and were baited. They were to be set only after any three of them had been used, since the aim was to move 10 hens and five toms. Two traps were used but only at irregular intervals. Turkey use of bait slacked off and practically ceased during April.

Bait has been placed in the general area of the traps in early fall of this year (1961) and was used until acorn fall made the corn less attractive. As acorns become unavailable it is anticipated that birds will be very susceptible to trapping.

In summary the Red Dirt population which excited our hopes in 1958 and 1959 has not produced as well as expected. The reason for this is unknown. The Bodcau area development is ready for stocking with native turkey from Idlewild and this should be done immediately following the close of quail season, February 15, 1962.

QUAIL RESEARCH

During the past two years quail research has consisted primarily of an annual post-season evaluation of quail production and hunter success. This has been made on a statewide basis and when the data has been based upon enough information the results have been considered by administrative districts. A comparison of differences in the production rates found in different districts has largely increased our ability to understand the general weather conditions favorable to high production.

Managed quail hunts on two game management areas have contributed to data from Central Louisiana.

Hunter success data, computed from report cards submitted by cooperating hunters, have contributed a great deal to thinking regarding the role of the hunter in regulating quail populations on a year-to-year basis.

An adequate age ratio sample, from which we chart production, is available for Rapides, Vernon and Natchitoches Parishes from the 1947-48 season through the present and indicates that production during the summer of 1960 was record low for this portion of the state. At the same time production of young from other areas of the state was about average. Throughout the years of sampling we have learned that summer drought is the most important factor adversely affecting production. It also seems that drought hurts production more on our non-agricultural quail ranges than on agricultural areas.

While no study has been aimed at measuring the effect of hunting on quail populations it is believed that our data show the effect that quail populations have on hunting. An examination of Table 1 shows that the "bag per hunter" ranged from 4.7 to 5.5 during the past four hunting seasons. The "percent of total bagged" had a reported range of 22.9% to 24.6% It is believed that the bag per hunter per day cannot fall much below the 4.7 reported for the 1960 season. If a large sample of hunting efforts are examined over a period such as a Louisiana quail season, there definitely seems to be a tendency for low hunting success to keep hunters from going quail hunting. Our best quail years seem to result in many more hunting efforts by less well equipped and less experienced hunters who succeed in bringing the average kill to about what was computed for the past four seasons.

If we continue to harvest about 24% of the estimated total then as birds become scarcer the kill falls off. The average kill per effort does not continue to fall because a few unsuccessful trips discourage the most persistent hunters so that they go less often or not at all.

While hunting pressure tends to level off and be subject to regulation by a natural law of "Diminishing Hunter Success" during long seasons, the same cannot be said for short restrictive seasons. An example concerning quail is the Fort Polk Game Management Area in Vernon Parish where the 1960-61 quail hunting was curtailed for 15 days by a restriction against the use of dogs during deer season. On the sixteenth day of quail season the area was opened and hunters rushed in from throughout the area because the quail had been "saved up" while their regular hunting areas had already been exposed to 15 days of open season. Although no accurate accounting of hunter success is possible large numbers of hunters were contacted in the field and their average success was very poor. It seemed to take several weeks for the average kill to pick up and this occurred only after the number of hunters diminished considerably. Usually a full day afield without satisfactory success would cause hunters, who had arrived with high expectations, to avoid the area for the balance of the season.

While hunter success information has been solicited from quail hunters they were also asked to contribute woodcock data. Though woodcock are locally important during some seasons to quail or rabbit hunters, Louisiana has very few woodcock hunters. We have been concerned with our lack of knowledge about the seasonal abundance of these birds in areas where they are available to sport hunting. During the past several years woodcock sight records submitted by quail hunters have been tabulated to attempt to learn the best time to recommend that the season be set. While hunting woodcock is growing more popular it seems that the total legal kill in Louisiana is very slight when compared to the kill in some of the states north of us.

Personnel of the U. S. Fish & Wildlife Service have developed a technique for determining the age of woodcock by wear and coloration of feathers of the wing. Age determination has been a useful tool of study for other game birds such as quail, doves, turkey and grouse and has long been employed by wildlife researchers. The recent development of the woodcock aging technique promises to allow a satisfactory measure of production without using the various census methods worked out for counting woodcock on the breeding grounds. Louisiana hunters are being asked to contribute wings to this effort.

BLACK FRANCOLIN RESEARCH

ROBERT E. MURRY

Project Leader

Is there a game bird anywhere in the world that can thrive in the Deep South? The bobwhite quail still thrives in some places. The prairie chicken is gone from Louisiana—perhaps forever—and one of the few small population segments remaining in Texas is losing out to a suburban development.

Neither of these birds will be written off entirely. The chicken never did provide sport throughout the state but was of great importance to those fortunate few who knew, hunted and observed the Attwater prairie chicken prior to the turn of the century. These birds, although providing excellent sport and the finest of table fare are best remembered for their drumming in the spring.

Habitat shrinkage is the malady which has most affected our bobwhite quail. Still produced in huntable numbers throughout much of the state the bobwhite is in no danger of expatriation, although the spectacular numbers of a few decades ago remain only in the fond memory of quail hunters.

The cold hard facts are that man changed the landscape to the point that only a small amount of marginal habitat remained for the prairie chicken. Lack of enforced conservation laws and lack of restraint on the part of hunters quickly mopped up the remnants of the population. The last known Louisiana bird was reported in 1919 in Cameron Parish.

Changes have affected quail numbers too, and almost always in the name of progress. Progress that grows more rice, beef, timber, etc.; food and fiber for a better living standard, cannot be halted to find room for another covey range. Nor can the birds adapt to man's newly created habitat. The less adaptable prairie chicken is gone; the bobwhite with his talent for fitting into a larger variety of habitat conditions will remain.

By glancing back into history we can conclude that the bobwhite is more numerous in Louisiana today than was the case that fateful October day in 1492 when Columbus discovered This Half. After the serious business of settling Louisiana began, most of the changes brought about by man were good for quail for the first couple of hundred years. The reason for this is that primitive agriculture and land clearing create quail ranges. We can surmise that quail populations went to an all time high during this period of early development. Primitive agriculture gave way to efficient farming with its large clean fields and improved pastures and fewer covey ranges. Although today's low probably represents considerably more birds than the stable forests and grasslands of Louisiana had in 1492.

We do not expect to ever again see great quail populations as incidental by products of agriculture. Nor do we ever expect to be able to afford to produce great quail populations by deliberate land management.

Some areas of North America presently depend a great deal on naturalized game for sport hunting birds. These birds originated in Europe or Asia. To date introductions of exotic game birds in the Deep South have resulted in a long and impressive list of failures. Game biologists can compare known facts about the habitat requirements of these birds and the actual habitat conditions offered by Louisiana and readily point to several reasons why birds such as the Hungarian Partridge, Ringneck Pheasant and Chukkar, which are established to the north, and to the west of us, would be expected to fail in the Deep South. Despite the apparent differences in the habitat requirements and habitat conditions it was only human nature to want to try to buck these "long-shot" odds and attempt to establish these fine birds in the south. All of these species have been repeatedly released in the Deep South, especially the Ringneck Pheasant and although some reproduction has occurred, it has never been significant enough to exceed the mortality rate. In a manner of speaking "outgo" has exceeded "income" to the point that each stocking went "bankrupt", some without rearing a single young.

Since throughout the United States a demand for new game birds has existed for some time and since this problem was being attacked by private groups as well as conservation agencies of the various states it became apparent that some coordination would be helpful. Since everything from abroad isn't necessarily good and good for us, for example, the English sparrow, the starling, the nutria and the imported fire ant; most states tightened up their laws regulating the importation and release of foreign things. The U. S. Fish and Wildlife Service began a study on foreign game likely to prosper in specific regions of this country. They were also interested in game unlikely to ever become a nuisance by over-population, crop damage, burrowing habits or direct competition with established native game.

In the case of birds the following was desired: (1) Adaptability to a habitat condition that either occurs naturally or has been created by man and is non-productive for native game; (2) A bird whose feeding habits are not detrimental to agricultural practices; (3) A bird of good flesh for eating purposes; (4) A non-migratory bird; (5) One that works well and lies well before a dog; (6) A bird of a size which is large enough to be attractive to hunters; (7) A breeding potential high enough to provide regular harvest.

This project has been under way for nine years and can serve to benefit us in either one of two ways. It could determine that nowhere in the known world does a game bird exist that seems to offer promise for Louisiana sportsmen. This type recommendation might serve to discourage us from hit or miss stocking efforts with almost inevitable failure as a result. The other way it can determine the most desirable game birds that have a reasonably good chance of success. This it has done.

From the study several birds have been suggested for trial. Dr. Gardner Bump, who heads this project for the Fish and Wildlife Service, has been enthusiastic about the similarity of the soil, rainfall, temperature and land-use of Louisiana and of some of the range of the black francolin (*Francolinus francolinus*) of Asia. Dr. Bump toured Louisiana in 1957 with personnel of the Commission.

Massive releases of wild trapped adult birds are recommended as having more chance of successful establishment than any other type of release.

A number of areas were checked out before release areas were decided upon. A simple contractual agreement protecting both the landowner and the sportsmen's interest was negotiated. Ten by 60 foot wire pens were constructed to hold the birds for a few days.

The first shipment of birds arrived on April 5th and were placed in the Gum Cove holding pen. Although Northern India, where these

Nest of the black francolin in Morehouse parish.

birds had been trapped only six weeks before, has temperature extremes comparable to ours, they were not equipped to stand the shock they met soon after entering the pen. A cold blowing rain with temperature in the forties and low fifties prevailed most of the night. These birds had been held in New York Port of Debarkation Quarantine for five weeks prior to their arrival at their new home. In transit the oiling and preening so necessary for insulation against wet and cold had been neglected. Despite brush pile shelters in the pen the birds tended to crowd to one end and became thoroughly wet and chilled. By daybreak on the 6th many were dead and many more completely immobile from cold and shock. Efforts of Commission personnel and Mr. R. A. Moore, landowner, revived some of the birds that had appeared to be dead—by warming them. The Black Francolin future looked considerably dimmer on April 6th.

The "gentle release" method was begun a few days later when about one-third of the birds were driven out the door of the pen. They flew for cover like king-sized quail and began the task of trying to provide Louisiana gunners a new target for the future. The remainder of the birds were released in two more bunches at intervals of several days between releases.

The Oak Ridge birds arrived April 19 and were placed in a pen similar to the Gum Cove pen except our sad experience dictated that this one should have one end covered from the rain and wind. These birds were released to the wild in groups similar to the Gum Cove release.

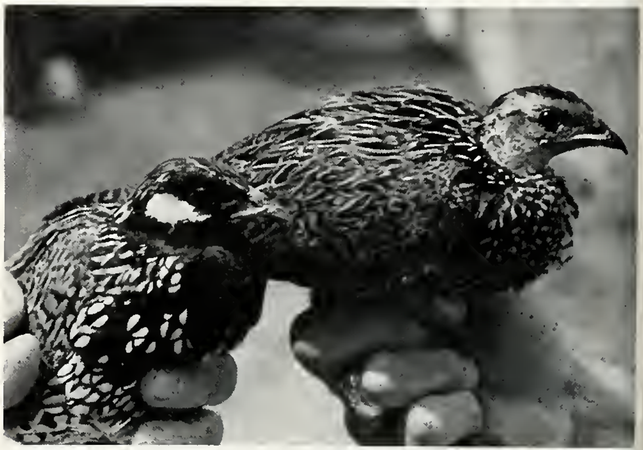
Soon after the Oak Ridge release Commission personnel reported males calling. Personnel checking the Gum Cove area were unable to hear males in this area calling. After many exchanges of comments the secret of hearing calling Black Francolin got out. To hear them call you have to first "see them call". They perch on any slight elevation or on fence posts and with what seems to be a great effort start the world's oddest love song or challenge or whatever it is. Once you see the antics and hear the very unbirdlike call you are able to associate the two in your mind's eye; then you are prepared to hear the black francolin. On a still day the cicada-like notes are audible to the average ear at distances up to one-quarter mile.

On both areas territorial behavior by the cocks was noted, in that they seemed to occupy the same calling stations several times during a day. They seemed to frequent a relatively small area during their calling periods and never in association with other cocks. Hens were seen much less frequently than males and were usually seen in company with a single male.

Farm and ranch employees provided valuable assistance in reporting nests, making brood counts and keeping posted on the occupied range. The landowners and their families, the R. A. Moores of Gum Cove and the Earle A. Barhams of Oak Ridge, have spent a great deal of time and effort to make these releases a success. Regardless of the ultimate outcome of the releases the Wild Life Commission and the sportsmen of this state owe a debt of gratitude to these people for their spirit of cooperation.

It is safe to state that at this writing Commission employees and Dr. Bump are more optimistic about our chances of establishing the black francolin than we have ever been.

Several nests have been found at Oak Ridge and two broods of young reported there. At Gum Cove no nests were located but four broods have been reported by people working on the ranch. What was apparently the products of two clutches and cared for by two hens was sighted on November 17. The young of this aggregation were either being incubated as eggs or were extremely young chicks when Hurricane Carla flooded the lower portions of the prairies around Gum Cove.



A pair of adult black francolins showing typical coloration and size.

DEER INVESTIGATIONS HERD STUDIES

DAN BENNETT
Study Leader

In these times of an increasing population, decreasing open hunting land and the 40 hour work week, the popularity of deer hunting is continually rising. It is the responsibility of the Louisiana Wild Life and Fisheries Commission to manage our deer herds so as to provide the hunter with the maximum possible number of deer. In order to accomplish this task we must know and understand as much as is possible about the life history, habits, and general condition of our deer herds of this state. Only through a comprehensive research program will such information become available. It is hoped that studies such as these will provide us with the answers we need to manage our deer herds more efficiently.

THE DEER MOVEMENT STUDY

Many biolgists have tried to develop a system that could be used in studying the movements of deer. In spite of all the efforts expended in this direction, there are apparently only two approaches to a solution of this problem. One of these methods requires the use of marked animals. The other method involves the use of miniaturized radio transmitters which are attached to individual animals.

Using the first method mentioned, a total of 46 animals from Red Dirt G.M.A. were trapped and marked with multiple markings so that their identity would always be detectable. At the beginning of this study the deer were branded on the side with branding fluid, fitted with colored collars, and ear tagged. As the study progressed it was found that the branding marks soon disappeared and this procedure was abandoned. The use of the colored collar was also found to be impractical. Through trial and error it was found that deer which were tagged in both ears with metal tags, tattooed in both ears, and had holes punched in each ear would best retain their identity. When one of these markings was lost, the identity of the individual was always apparent from the remaining marks. During the course of this study, it was found that the average movement of deer on Red Dirt Game Management Area in Natchitoches Parish was approximately 1.7 miles. This is based on the recovery of 13 marked animals which were killed on the managed hunt in November of 1960. This average was obtained by measuring the distance in air miles from the traps where the deer were originally marked to the spot where the deer were killed. The hunter that killed each marked animal plotted on a map of the area the approximate location of where the deer was killed.

The other possibilty of obtaining movement data on deer which was explored was the use of miniaturized radio systems. These small transmitters would enable us to plot on a map at any given time the exact position of the deer carrying the radio device. A considerable amount of correspondence was carried on with several researchers throughout the United States and Canada in an attempt to locate the radio gear that was needed to initiate a study such as this. It has been found that at this time there is no commercial source of this special equipment. Although at least two large radio companies are currently working on minature transmitter systems, they have not yet developed a prototype transmitter which will meet field requirements. Within the very near future, however, we should be able to obtain the equipment we need to accurately trace the movements of deer. Until such time as this equipment becomes available we shall be forced to discontinue this phase of research.

THE SOUTHEASTERN COOPERATIVE WILDLIFE DISEASE STUDY

Eleven states from the Southeastern United States including Louisiana have joined together to form a cooperative project dedicated to the study of wildlife diseases and parasites. This project is known as the Southeastern Cooperative Wildlife Disease Study. Formerly known as the Southeastern Cooperative Deer Disease Study, the scope of the research program has been broadened to include other kinds of wildlife as well as deer. All diagnostic work, laboratory testing and technical evaluation is done by the University of Georgia School of Veterinary Medicine. A complete staff of trained veterinarians and technicians are available to devote full time to wildlife disease and parasite investigations for the states belonging to this project. Any information obtained in this study is mutually shared by member states and is officially published in technical journals. Technicians and veterinarians are available from the study to make field investigations of disease outbreaks, animal mortality, or parasite infections.

In the early spring of 1960, the muskrat in an area on Sabine Lake began mysteriously dying. The S.C.W.D.S. was notified and they immediately dispatched a field crew to the area to gather as much data and laboratory specimens as possible. About one month after the first investigation a second field group was sent by the S.C.W.D.S. to complete its investigation of the area. From the information collected on these trips the technicians of the S.C.W.D.S. were able to determine that the cause of the muskrat mortality was not a disease or parasite as was suspected at first, but from Hydrogen Sulfide poisoning. Hydrogen Sulfide is a compound normally found in the marsh, but natural phenomena had created abnormal concentrations of this chemical in the area where the muskrat die-off occurred.

The staff of the S.C.W.D.S. was summoned to Louisiana in August of 1961 to make an inventory of parasites occuring in the White-Tail Deer here. A total of 11 deer were autopsied. Although the complete report of the findings from this investigation has not been received as yet, a preliminary report indicates that some of the deer examined carried as many as seven species of parasites, some of these at a high level of infection.

During the last two years the laboratories of the S.C.W.D.S. have examined 493 deer blood samples, 166 deer livers and the digestive tracts from 17 wild turkeys. The blood samples were examined for the presence of Brucellosis and Leptospirosis. The deer livers were examined for the incidence and degree of infection of the Large American Liver Fluke. The turkey viscera were examined for a complete parasite survey of the wild turkey. The results of these examinations are being published in technical reports.

You have probably begun to wonder why a program of this type is a necessity, realizing that it would be impossible to vaccinate all wild animals against disease or treat them for parasites. This line of reasoning is entirely correct and there is no intention of doing so. Our main interest in studying animal parasites and diseases is to provide us with additional information which will aid us in the scientific management of our deer herds. Without a thorough understanding of all of the factors affecting or controlling the physical condition of our deer, we cannot hope to manage them efficiently.

THE DEER REPRODUCTION STUDY AND THE GENERAL CONDITION STUDY

Even though these two studies are conducted as entirely different phases of the deer research program, they both serve to keep us informed of the general condition of our deer herds.

By the examination of the reproductive tracts of doe deer we can determine the approximate number of fawns that will be produced during the current breeding season, the approximate number of fawns produced the immediate past breeding season, and predict the period at which breeding in any given locality is at its peak. Nutritional deficiencies will be reflected in lowered total fawn production. Deer from poor range will have fewer fawns than deer from good range. As deer populations pass their peak and destroy their range, fawn production will decrease. Thus by the examination of the reproductive tracts from any deer herd we can determine whether or not the deer from that herd are in top physical condition.

A total of 296 reproductive tracts have been examined during the last two years. These reproductive tracts were collected during the managed hunts on game management areas throughout the state. The information obtained from the examination of these tracts has added considerably to our basic knowledge of reproduction of the deer of our state.

In addition to the examination of reproductive tracts, we can detect trends in the rates of reproduction by computing the number of fawns produced. This is done by dividing the total number of fawns taken from an area by the total number of adult (over 1½ yrs. old) does from that area. By multiplying this figure by 100 we can obtain the number of fawns produced per hundred does within a given population. The following table lists this information compiled as a state-wide average for the game management areas for the past three hunting seasons.

TABLE OF REPRODUCTION RATES OF DEER ON LOUISIANA GAME MANAGEMENT AREAS BASED ON KILL DATA

	1959		*1960*		*1961*	
Management Area	*Fawns*	*Adult Females*	*Fawns*	*Adult Females*	*Fawns*	*Adult Females*
Catahoula	71	77	...	...	41	33
Chicago Mill	180	167	79	132	...	...
Evangeline	29	13	52	33	41	23
Jackson-Bienville	98	89	13	16	30	26
Red Dirt	84	90	42	43	35	20
West Bay	...	...	64	56	118	92
Totals	462	436	250	280	265	194
	106 Fawns/100 Adult Does		89 Fawns/100 Adult Does		137 Fawns/100 Adult Does	

Complementing the information on reproduction that we have obtained is the data concerning the physical features of the deer taken on the management areas. These data include ages, sex, weights and antler measurements. Each year this information is recorded and compared with the previous year's information. In this manner we are able to detect any changes which may occur within the various age classes. The following table gives a comparison of average computed live weights for several of the game management areas during the last two hunting seasons.

TABLE OF COMPUTED LIVE WEIGHTS OF DEER KILLED ON SOME LOUISIANA GAME MANAGEMENT AREAS DURING THE 1960 AND 1961 CONTROLLED HUNTS

Age		*AREA*											
		Catahoula 1960	*Catahoula 1961*	*Chicago Mill 1960*	*Chicago Mill Nov. 1961*	*Evangeline 1960*	*Evangeline 1961*	*Jackson-Bienville 1960*	*Jackson-Bienville Nov. 1961*	*Red Dirt 1960*	*Red Dirt 1961*	*West Bay 1960*	*West Bay 1961*
6 Mos.	Male	....	*21 54.6	42 66.0	....	28 57.2	23 60.0	7 58.4	18 60.4	22 59.7	18 60.4	23 50.0	17 55.3
	Female	....	20 53.4	37 58.2	....	24 52.1	18 54.7	6 49.9	12 54.9	20 53.2	12 54.9	41 46.0	.... 50.6
1½ Years	Male	45 95.5	40 97.2	81 112.3	93 129.0	20 94.6	26 95.8	24 120.5	27 111.6	39 93.0	27 111.6	64 80.3	39 95.8
	Female	....	13 80.8	36 91.5	....	12 79.4	14 79.1	9 91.6	7 100.8	15 83.7	7 100.8	17 73.6	12 78.1
2½ Years	Male	10 114.2	26 118.0	76 155.9	52 154.5	12 102.1	5 106.6	7 158.8	15 158.0	10 121.6	15 158.0	34 97.5	9 120.6
	Female	....	13 84.2	46 110.5	....	8 82.4	7 87.2	10 112.5	7 113.9	17 86.6	7 113.9	25 74.6	8 84.6
3½ Years	Male	10 135.6	20 138.4	48 188.5	38 174.2	9 109.5	11 117.6	5 175.8	14 176.0	16 119.9	14 176.0	25 105.4	7 135.9
	Female	....	7 102.0	37 115.5	....	14 86.6	8 93.3	2 123.8	10 116.4	7 93.9	10 116.4	14 91.1	3 83.6
4½ Years	Male	2 128.3	3 154.7	22 203.0	18 216.2	5 141.5	3 155.1	....	1 208.0	2 137.0	1 208.0	5 103.6	9 134.2
	Female	....	5 87.6	20 119.9	....	6 96.9	3 91.5	3 114.0	6 121.1	8 93.2	6 121.1	10 84.0	3 92.9
5½ Years And Up	Male	2 139.2	1 139.7	6 195.6	1 225.0	7 131.4	2 154.8	1 225.0	1 203.8	7 147.1	1 203.8	10 116.7	9 135.4
	Female	....	8 101.6	29 112.4	....	8 96.0	.... 91.6	1 82.0	3 116.0	11 91.9	3 116.0	7 87.5	6 100.3

---

* Denotes size of sample involved.

WEIGHTS OF BUCKS KILLED ON CHICAGO MILL GMA DURING THREE SEASONS OF CONTROLLED HUNTING

Age	*1959*	*1960*	*1961*	*Sample*	*Net Change From 1959*
1½ years	105.5	112.3	129.0	93	+2185.5
2½ years	143.4	155.9	154.5	52	+1132.2
3½ years	178.7	188.5	174.1	38	− 174.8
4½ years	208.2	203.0	216.2	18	+ 144.0
5½ yrs. & up.	198.3	195.6	225.0	1	+ 26.7
Total Net Change					+3313.6

COMPUTATION

$$\frac{\text{Total Net Change (3313.6)}}{\text{Total No. of Deer (213)}} =$$ 15.5 pounds of live weight average gain per animal killed in 1961 as compared to a comparable sample based on 1959 averages.

Explanation of Above Table:

For the above comparisons weights of all buck deer 1½ years and older taken during the past three seasons were used.

If crowding reduces animal size then we should expect a harvest to cause a weight gain. To explore this possibility this comparison makes use of the difference between the 1959 weights and the 1961 weights. This difference is multiplied by the number of deer in the 1961 sample. The product is shown in the column labeled "net change from 1959" and has either a plus or negative value.

Since the total net change is computed at a live weight gain of 3,313.6 pounds, we can divide the total sample size (213 deer) into the total net change and get an average net gain of 15.5 pounds per deer. This change is believed to be highly significant and indicative of a change towards a better range and a more thrifty deer herd.

TABLE OF HUNTER SUCCESS FOR SOME LOUISIANA GAME MANAGEMENT AREAS FOR THE 1960 AND 1961 HUNTING SEASONS

	1960		*Hunter Success*	
Area	*No. of Hunters*	*No. of Deer Killed*	*"Bucks Only"*	*"Any Deer"*
Catahoula GMA.	1,541	69	1/22	
Chicago-Mill G.M.A.	9,359	746	....	1/12
Evangeline G.M.A.	2,226	154	....	1/14
Jackson-Bienville G.M.A...	2,616	75	....	1/35
Red-Dirt G.M.A.	4,898	174	....	1/28
Sabine G.M.A.	409	8	....	1/51
Union G.M.A.	272	5	1/54	....
West Bay G.M.A.	5,769	279	....	1/20
TOTAL (State-wide)..	22,090	1,510	....	1/18

	1961		*Hunter Success*	
Area	*No. of Hunters*	*No. of Deer Killed*	*"Bucks Only"*	*"Any Deer"*
Caldwell G.M.A.	365	21	1/17	....
Catahoula G.M.A.	3,218	177	....	1/18
Chicago-Mill G.M.A.	5,182	259	1/20	....
East Carroll G.M.A.	62	2	1/31	....
Evangeline G.M.A.	2,425	125	....	1/19
Jackson-Bienville G.M.A. ..	2,350	123	....	1/19
Red-Dirt G.M.A.	3,245	141	....	1/23
Sabine G.M.A.	319	4	....	1/80
Union G.M.A.	940	45	....	1/21
West Bay G.M.A.	7,643	455	....	1/17
TOTAL (State-wide)..	26,049	1,352	....	1/19

DEER INVESTIGATIONS RANGE STUDIES

LOUIS E. BRUNETT

Study Leader

The deer range in Louisiana is constantly going through changes. Some of the changes are rapid while others are more moderate. Some changes are beneficial to deer while others are a detriment. Some of the changes are natural while others are imposed by man. Changes are created by man by logging, timber stand improvement, burning, chemical treatment of hardwoods to establish pine, establishment of pine, overgrazing by livestock, and overbrowsing by deer.

Herbicides are playing an important part in hardwood control in pine forest management. Some of the herbicides are applied by aerial spray or the mist blower. The effects of the herbicide on deer browse plants are largely unknown. Those that do produce the most desirable effects on browse species and on hardwoods should be recommended for use by the forest manager interested in deer. It may also be feasible to use herbicides to deliberately manage those species that have grown out of reach of deer.

A study was begun to determine which herbicide would produce the most desirable sprouting in deer browse plants. In the spring of 1959 five plants each of yaupon *(Ilex vomitoria)*, gallberry *(Ilex coriacea)*, red bay *(Persea borbonia)*, and white bay *(Magnolia virginiana)* were treated with a basal application and a breast height application of 2-4D isopropal ester at 4, 8 and 12 pounds acid equivalent per hundred gallons. Five plants each of the above species were treated with 2-4D amine with the same two types of application and three concentration levels.

Those plants were observed during 1959. The various chemical mixtures at the three concentration levels proved ineffective.

In 1960 2-4D isopropal ester at 8, 12 and 16 pounds acid equivalent per hundred gallons was used to treat yaupon. Twenty plants were treated with each of the above amounts of herbicide in water and diesel oil. Ten plants were treated with each of the above amounts of herbicide in diesel fuel only.

The treated plants were kept under observation. In June 1961 the inspection revealed that all of the plants treated with the three concentrations of diesel fuel and 2-4D appeared dead with no sprout growth. The effects of this mixture was too severe.

Inspection of the plants treated at the three prescribed concentration levels of diesel fuel, water and herbicide revealed various results. In those treated with 8 pounds acid equivalent per 100 gallons some plants main stem were dead and others were living. All of those plants had put on some sprout growth at the root collar. In those treated with 12 pounds acid equivalent per 100 gallons the main stems of a few plants were living; the remainder dead. These plants had put on some sprouts at the root collar. It appeared that these had put on the most sprouts and they had made the most growth. The main stems of all the plants treated with 16 pounds acid equivalent per hundred gallons had died, but some sprouts had been put on at the root collar. All of the above plants will be kept under observation.

Based on the observed results the 12 pounds acid equivalent of 2-4D in water and diesel oil was the better of the materials tested. However, the effect of this mixture has a lot to be desired. The desired effect of the herbicide is to kill back the main stem of those plants that are too high for deer to feed on, but at the same time not killing the root system of the plant. With the roots living sprouts will be put on where the roots join the main stem. Usually many sprouts are put on for the one main stem killed and those sprouts will be the food within easy reach of deer.

Pineland managers have used the control burn as a management tool. The control burn was first used by those managing stands of longleaf pine. Managers of slash, loblolly and shortleaf pine are gradually using a control burn to manage those stands and are getting good results. The burning program employed by the pineland manager will depend on the results desired.

A controlled burn has long been recognized as a tool of deer range management. To determine the effects of prescribed burning on deer browse species a study was begun in 1959 and completed in 1960.

On the Red Dirt Game Management Area two —forty acre deer corrals were set up for another study. In February 1959 one of the corrals was burned, with a controlled burn, according to United States Forest Service recommendations. After burning, five plants each of yaupon, red bay and white bay and five clumps of white bay were selected for study. Three plants of largeleaf gallberry were selected. Five plants of each of the same species that were not burned were selected as controls.

In selecting the plants for study an effort was made to select plants that did not offer any browse for deer because of their height. Everything over five feet was considered unavailable. The plants selected for study were checked at the end of the first growing season for the number of new stems originating on the old stump and the total length of new growth was measured.

The stem counts and measurements of new growth for the stems revealed various results for each species. In checking the five plants of yaupon there was an average number of 10.4 new stems produced with an average of 191.4 linear inches of new growth. The five plants of red bay produced an average of four new stems and an average of 76 inches of linear growth. For the five single stems of white bay there was an average of 5.2 stems produced with an average of 102.2 inches of new growth. Since a characteristic growth habit of white bay is to grow in clusters five such vegetative groups were checked. There was an average of 22.2 stems produced for an average of 928.4 inches of new growth per group. The three stems of gallberry produced an average of 5.33 new stems for each old one with an average of 58.66 inches of new growth. A general observation showed that not only those plants checked but sweetleaf, fringe tree, French mulberry, blackgum and dogwood also put on some luxuriant growth.

The checks of the controls revealed no new stems produced by yaupon, red bay or largeleaf gallberry. For white bay the clusters selected for controls produced an average of one stem for an average of 25.4 inches of new growth. Of the five non burned single white bay stems selected as a control one stem produced two new stems for a total linear length of 14 inches. Fire under proper control is a valuable tool for deer management. More still needs to be known as to when and how to apply fire for best results. Wild fires and fires that unnecessarily damage commercial timber are still to be avoided.

Another study conducted in the two deer corrals at Red Dirt was to determine the required height and angle to cut woody browse species to produce the best sprouting. Five plants each of yaupon, gallberry, red bay and white bay were cut parallel and at a 45 degree angle to the ground at heights of 6, 12 and 18 inches. White bay cut 18 inches parallel to the ground and those at 12 inches at a 45 degree angle produced the most stems and greatest length of new growth. For gallberry those cut 12 inches to the ground, both parallel and at a 45 degree angle produced the most stems and greatest length of new growth. For yaupon those cut 18 inches in both groups produced the greatest length of new growth. For red bay the 18 inch cuts in both groups produced the greatest number of stems and greatest length of new growth.

Large landowners are planting vast acreage, mostly in cutover pine land, to pine. Some of the landowners and timber managers are interested in producing deer browse, but at the same time, produce the maximum of commercial timber.

There is a study in progress to investigate the introduction of deer browse plants in pine forests. The study is designed to gather information and to demonstrate the effects planted pine and deer browse species have on each other. In this relatively new study seed have been gathered and are in storage for planting next spring. All available literature on seed germination of the various browse species have been reviewed.

On the Marydale Plantation, in Tensas Parish, six deer exclosures 80 feet by 80 feet in size were constructed in the summer of 1956. Adjacent to the exclosures a control area was set up. There were two exclosures and controls set up for each of three types of overhead canopies. The three types of canopies were open, medium and heavy.

The construction of the exclosures and the adjacent control areas was used in a study to determine the relative importance of shrubs, vines and trees in delta hardwood types for deer foods and the extent of damage of deer browsing on hardwood reproduction.

In each exclosure and control each species of forbs or shrubs was counted along a transect 100 links long and two links wide. There was one transect run per exclosure and one per control. The forbs were recorded by number of each species and the woody plants were recorded in the same manner, plus the height class being recorded in two foot intervals up to six feet. These stem counts and measurements were made on or about May 15 of each year.

In an effort to gain further information regarding the effect of deer use on commercial timber reproduction, height and diameter measurements were taken annually before the growing season started. The diameter measurements were taken three inches above the ground. The height measurements involved measuring the main stem from the ground to its tip.

The vegetation checks in the exclosures and controls and the stem measurements of commercial timber species were made for four years. The results do not reveal any significant difference between the exclosures and controls. This is probably due to the removal of deer in the early part of the study. At the time the study was planned it was felt that an over-population of deer occurred in this area. During the deer hunting seasons of 1959 and 1960 deer other than legal deer could be taken by permit only. It was estimated that 2600 deer were killed during both those hunting seasons. This is probably why the results do not reveal any significant difference between the exclosures and controls.

ANNUAL INVENTORY OF DEER RANGES

With the rapid increase of the deer herds in the State, it is important to inspect and keep records of all information on the ranges that the herds occupy. This information would indicate the condition of the range and aid in the setting of the deer season for that area. The inventories are conducted by the Study Leader and the respective District Supervisors.

The information is gathered by visiting the area occupied by a given deer herd. The information is reported by giving a description of the area giving location, physical boundaries and timber types by approximate percent of each. A history of the area is presented covering the past five years to include if herd is from stocking or natural population. Factors adversely affecting deer are reported to include displacement by floods or storms, clearing of agricultural land, growth of timber in relation to rate of harvest, harassment by dogs, poaching or competition with other animals. Factors that affect hunting such as accessibility of area, proximity to population centers, ground cover and terrain, and approximate percent of area open to public hunting is reported. Two of the most important things reported are: (1) general availability of good browse, estimated degree of use, and browse supplements and; (2) condition of herd from previous kill records to include physical condition, antler size and development, number in each age class and adult fawn ratios from track counts. Sight records, deer use of salt licks and track counts are also reported.

A pond, approximately one-quarter acre in size, was excavated in each enclosure.

Records are being maintained on unstocked areas, areas of low population and recently stocked areas. Unstocked areas, if suitable, will be recommended for restocking. Areas restocked with deer, upon completion of the mandatory five year closed season, will be checked annually with the objective of opening the deer hunting season.

To determine the condition of deer ranges, some browse surveys were conducted. The deer browse surveys will probably be discontinued for the future. They are time consuming and it is felt that an ocular estimate can serve the same purpose and save a large amount of time.

The objective of the browse survey is to determine whether the range is overstocked, properly stocked or understocked insofar as the food supply is concerned. This condition of the range can be determined by making comparisons between the percent of browse available and the percent of food eaten.

The browse survey conducted on the Red Dirt Game Management Area in 1960 and 1961 indicated that the cattle free range and cow pasture were not overbrowsed. On the Catahoula Game Management Area the browse survey of 1960 and 1961 indicates the range on both open range and cattle free area, was overbrowsed. The browse survey conducted on Zemurray Park in 1960 and 1961 indicated that it is overbrowsed. The browse

A nine foot deer-proof fence was constructed around the three enclosures and their controls.

surveys conducted on the Jackson-Bienville Game Management Area and in Tensas and Madison Parishes in 1960 indicated that these areas were overbrowsed.

COOPERATIVE DEER RANGE STUDY

Deer herds are building up rapidly in Louisiana. Most forested areas in Louisiana have deer with numbers ranging from scarce to abundant. In the south no technique has been devised to determine carrying capacity of any range. The overall effects of pine forest reproduction on deer browse plants is not known, however. It is known that at different stocking levels preferences for various species of plants increase. On an overpopulated range, deer may readily consume a species of plant while on a range in balance with the herd that same species may be less nutritious. Consuming the species of lower nutrition will cause the deer to have a smaller number of fawns, poor antler development and be smaller in body size. In order to more adequately understand the interrelationships between various levels of deer populations and the range this study was undertaken.

This study was undertaken by the Louisiana Wild Life and Fisheries Commission in cooperation with the Southern Forest Experiment Station, and the Kisatchie National Forest of the United States Forest Service. The Soil Conservation Service will assist in making certain soil measurements and give advice pertaining to the soil. The overall planning and establishment of the study was a joint endeavor of the Louisiana Wild Life and Fisheries Commission and the Alexandria Research Center, Southern Forest Experiment Station.

The cooperators are responsible for specific segments of the project. The Alexandria Research Center is responsible for the vegetative phase while the Louisiana Wild Life and Fisheries Commission is accountable for the biology of the study animals and maintenance of the fences. The Kisatchie National Forest furnished the study area and will provide management of the timber.

The area selected for installation of the study is typical of the loblolly shortleaf pine-hardwood forest type. In that particular forest type Louisiana has approximately 4,012,000 acres in central, north and northwest Louisiana. Practically all of this type is owned by the United States Forest Service and large landowners and is open to public hunting.

The study is designed to study static populations of deer in enclosures at the stocking level of one animal per 20, 40 and 80 acres. Three deer enclosures, each 160 acres in size, were constructed for the study. A 20 acre exclosure was paired with each enclosure for a control. Static deer populations will be maintained by using only female deer.

The overall objective of this study is to gain a better understanding between deer and their range in the loblolly-shortleaf pine-hardwood forests of Louisiana and the carrying capacity of this forest type. Specifically the study has the following objectives under three different stocking rates:

1. To determine the availability of forage and the species preferences by deer during the summer and winter seasons.
2. To determine forage "indicator" species that would serve as management guides in determining approximate deer stocking levels per unit area and in regulating proper range use.
3. To determine the effects of different intensities of deer stocking and forage use upon the condition and trend of the range and forest reproduction.
4. To determine the production of oak mast and its influence upon forage use and deer condition.
5. To determine the physical response of deer to range conditions that prevail under three different levels of stocking and the prescribed forest management practices.

After selection of the study area diagrams were drawn to scale of the enclosures and exclosures. The exclosures and enclosures were set up so that common sides could be used to reduce fencing costs.

In the spring of 1960 an engineer and survey party located the fence line by survey. Following the survey merchantable timber along a 16 foot fence right-of-way was salvaged. A bulldozer was used to clear the fence right-of-way and excavate a pond in each enclosure. The ponds, approximately one-quarter acre in size, are to furnish water for the deer.

At each entrance to the enclosures two 52 inch gates, one on top of the other, were used.

In the late summer of 1960 a contract was let to construct a nine foot deer proof fence. The fence was completed in January 1961. A deer trapping operation was conducted on the Catahoula Game Management Area in Grant and Winn Parishes to obtain deer for the enclosures. The necessary deer were trapped and the enclosures stocked at the rates of two deer per one 160 acre enclosure; four deer per one 160 acre enclosure; and eight deer per one 160 acre enclosure. Female deer six to nine months old were used.

Personnel of the Alexandria Research Center, Southern Forest Experiment Station, United States Forest Service, put in the study plots and transects necessary to accomplish the objectives. The plots put in were timber inventory plots and forage production and utilization plots. The transects put in were to determine range condition and trend. Mast traps were erected to collect acorns for production studies.

The results of this study are expected to have considerable effect upon future deer management in this important timber type of Louisiana. The results should be proper harvest regulations so that the land is made to produce a maximum in good deer hunting.

WATERFOWL INVESTIGATIONS

MORTON M. SMITH

Study Leader

This investigation of the Louisiana waterfowl resource, under the direction of the Pittman-Robertson Section, was begun in July 1949 and has continued to the present date. Through the years the primary objective of the study has been to obtain the information needed to provide the best possible hunting for the state's waterfowlers within those limits imposed by the federal government.

With the assistance of the biologists and other field personnel of the Fish and Game and Refuge Divisions, a large volume of data concerning waterfowl was gathered. These data were analyzed and presented in four technical reports that appeared this year under the titles:

1. *Louisiana Waterfowl Population Study*
2. *Louisiana Hunting Pressure Study*
3. *Louisiana Wood Duck Studies*
4. *Louisiana Mottled Duck Surveys*

The activities of the waterfowl segment during 1960 and 1961 are described in the accounts that follow:

WATERFOWL POPULATION STUDY

Habitat

As noted in the last Biennial, Hurricane Audrey in 1957 wrought considerable changes in the marshes of southwestern Louisiana. The changes now appear to have been beneficial for waterfowl because in the years that followed tremendous crops of millet and other high quality foods were produced in the lower marshes of Cameron and Vermilion Parishes.

The production of waterfowl foods in southwest Louisiana continued through 1960 and a crop may have been made in 1961. The area was swept by severe storm tides from Hurricane Carla which struck the Texas coast in September of this year. What the long term effects of this latest storm will be on waterfowl use in that section is uncertain.

The southeastern Louisiana marshes produced very good stands of aquatics during the two years of report. The heavy growth of aquatics may be related to the high rainfall and reduced salinities of the past two years. High tides from Hurricane Carla covered this section and the full effects of the storm are still unknown. But aquatics continue generally abundant in the area.

The delta marshes at the mouth of the Mississippi River show continued improvement and the 1960 and 1961 conditions are the best since the early fifties. This year's crop of delta duck potato and three square are the finest in recent times. The storm did little damage to this area.

Catahoula Lake produced a good crop of chufas and millet in 1960 and a smaller crop in 1961. Summer water levels were high in 1961 and food production was limited to the higher flats around the lake.

Elsewhere in north Louisiana waterfowl habitat conditions were satisfactory. Mast production during the two years of report was very good over most of the state.

Waterfowl aerial census of ducks are conducted each year by Wild Life and Fisheries Commission.

Censuses

Throughout the fall and winter periodic aerial counts were made of the Louisiana waterfowl population. The counts were gathered by aerial checks of known waterfowl concentration areas and from regular routes flown over the coastal marsh. The marsh areas were flown at low altitudes and speed in a Cessna 180 land plane. Offshore areas were surveyed in a twin engine amphibian. The study leader and Commission pilot Nelson Summerell were responsible for these periodic counts. Pilot Buck Davis assisted in surveys of the offshore areas.

These aerial inventories have been made every season since 1951 and provide information on the distribution, migration, local movements and availability of ducks, geese and coots to the hunters.

The 1960 surveys began in early October and, as usual, blue winged teal were the most common species found. By late October a large number of waterfowl had moved into Louisiana. Over two million ducks were tallied and the great majority were found in the coastal marshes of southwest Louisiana. All dabbling species were well represented except the mallard. No estimates were made of the scaup (dosgris) population in late October but it is certain many were in offshore waters.

Waterfowl numbers continued to increase through November and December with the arrival of additional migrants, particularly mallards. In addition, these later inventories found a larger part of the scaup population wintering in coastal waters.

The annual mid-winter waterfowl survey was run in early January of 1961 and the state population of ducks, geese and coots was the highest ever recorded during this study. It was estimated that five and a half million waterfowl were to be found in Louisiana and populations of dabbling ducks, diving ducks, and geese reached record highs.

Aerial inventories conducted in offshore waters indicated that the scaup was Louisiana's most abundant species of waterfowl. In mid January a million and a half scaup were tallied in the coastal bays and Gulf waters of Louisiana.

State waterfowl populations gradually declined through the spring. Most ducks departed in February and March but many were still found in April and even May.

Only very limited information was available for Louisiana waterfowl populations in the fall of 1961. At this writing only two aerial counts have been made but no flights have covered the offshore areas.

The October 1961 flights of waterfowl into Louisiana appeared to approach those of 1960 in size. As in years past the majority of these birds were located in southwest Louisiana.

WATERFOWL KILL SURVEYS

Bag and Composition

Under the provisions of a cooperative agreement between this state and the federal government an annual survey is made to determine the size and composition of the Louisiana waterfowl kill. There are limitations in the data obtained but when compared to other methods, these surveys probably provide the best information at the lowest cost.

The duck kill in Louisiana during the 1960 season was estimated at 378,000 birds. In 1959 the state kill was believed to be about 386,000 ducks. In both of these years seasons were short and continental duck populations were reported to be low.

No kill figures for the 1961 season are available at this date. But the very short season this year and the daily bag of three should result in an even smaller kill than that found last year.

The single most important species in the kill each year has been the mallard. Other important ducks for the Louisiana hunter are the pintail, blue-winged and green-winged teal, the scaup, gadwall, baldpate and wood duck in relative order of occurrence in the kill.

An unusual situation was found in 1960 in regard to the kill of scaup. Great numbers of these ducks were seen on the lakes and coastal bays during aerial surveys. In other years these ducks had moved into the marsh areas during either late November or December but in 1960 most scaup remained on the open waters throughout the entire winter. The reasons for this change in habits is unknown but the result was a large reduction in the kill of scaup in 1960 since the birds were relatively safe on the large lakes and bays. This was of particular importance to the hunter of southeast Louisiana since the scaup comprises a considerable portion of the total kill there.

Age Ratios

A statewide study designed to gather information on the ratio of young to adult ducks in the hunter's kill was continued during the 1960 season. Such information, when combined with that from other states, is used as a check and supplement to data collected by various breeding ground surveys in the northern United States and Canada. These breeding ground surveys are of primary importance in establishing hunting season lengths and bag limits.

Biologists of the Fish and Game and Refuge Divisions gathered ages on 1,545 ducks during the 1960-61 season. For dabbling ducks there were 1.02 young per adult in 1960. This was a considerable improvement over the very poor .33 young per adult found in 1959. It appeared that the ducks that wintered in Louisiana produced more young in the summer of 1960 than in 1959 and this agreed with reports from the breeding grounds.

Comparable information for diving ducks is not available for 1960 because the sample checked was so small.

No information is yet available from the 1961 duck season.

Waterfowl Weights

Biologists of the Refuge Division were able to gather weights of waterfowl at Grand Chenier and Pass-a-Loutre at the same time that the age ratios of the birds were collected. The average weights of the various species (sexes and ages combined) from these two areas appears in Table I.

Table I

LOUISIANA WATERFOWL WEIGHTS

Species	*Avg. Weight In Ounces*
Mallard	41.4
Gadwall	31.9
Baldpate	28.7
Green Winged Teal	12.5
Blue Winged Teal	15.4
Shoveler	21.7
Pintail	35.1
Mottled Duck	39.4
Blue Goose	67.3

PRODUCTION SURVEYS

Special studies of the Louisiana wood duck population have been carried on in conjunction with a cooperative project among Mississippi Flyway states. Emphasis was placed on gathering information on production and on banding the birds.

The estimates of wood duck production in Louisiana were based on a check of the use made of wood duck nesting boxes in the state. In 1960 39.5 percent of 124 boxes checked were used by wood ducks and in 71.4 percent of the boxes the nests were successful. In 1961 53.7 percent of 108 boxes checked were used by woodies and 63.8 of these nests were successful.

From information gathered in other Mississippi Flyway states it appears that the wood duck population is now high, not only in Louisiana, but in the entire eastern United States. Present continental populations of the wood duck are thought to be considerably higher than those of the mid fifties.

DUCK BANDING

In State

Louisiana has been active in banding work and during 1960 and 1961—1348 ducks were banded in this state. Nearly 700 of these birds were wood ducks. About half of the ducks was banded by Bob Chabreck and Bobby Harmon of the Refuge Division at the Rockefeller Refuge. The remaining half was banded by Bob Kimble, Jim Taylor and Charles Baur of the Fish and Game Division who specialized in wood duck banding.

Waterfowl study leader Morton Smith is shown banding a young mallard hen during one of his visits to Canadian breeding grounds.

A wood duck hen is banded as part of a study on these beautiful birds.

Canadian Banding

Each year since 1954 Louisiana has sent at least one man to Canada to assist in a large scale cooperative banding program on the Canadian breeding grounds. The program is directed by the U. S. Bureau of Sport Fisheries and Wildlife in cooperation with Canadian authorities.

A series of banding crews composed of state, federal, and Canadian personnel cover most of the prairie breeding grounds. This tremendous banding effort is providing fundamental information on the continent's waterfowl resource.

In 1960 the Louisiana representative to the cooperative banding program was Mr. Dan Dennett who worked in the vicinity of Prince Albert, Saskatchewan. The crew to which he was attached was hindered by the severe drought in progress at the time but still managed to band 911 birds.

This year Mr. Ray Palermo volunteered for the summer banding work and was attached to a crew working in east Central Alberta. A total of 8380 ducks were banded by this crew and it led all other crews in numbers of ducks banded.

EVALUATION OF PUBLIC SHOOTING GROUNDS

The Fish and Game Division is presently engaged in experimental development work designed to improve the habitat on two tracts of coastal marshland. These areas are being developed for use by the public as places to hunt waterfowl. In order to measure the effects of these development programs studies have been inaugurated to measure changes in the aquatic vegetation on the developed areas and the hunter day use of these areas.

The vegetative studies are conducted by sampling the aquatic plants in selected ponds on the area. Both ground samples and aerial photographs have been used in this work.

The estimates of hunter day use have been made from information gained through a series of aerial flights over the Wisner and Biloxi areas. Because of the great number of entrance points to each shooting ground, the extensive use of the areas for fishing, and the limitations imposed by available funds and personnel, it seemed impractical to complete the hunter day use surveys by ground checks.

The evaluation of the developments is still in the preliminary stage and no estimates can be made of their effect at this time. Results of these studies will be reported on in future biennials.

LOUISIANA WATERFOWL AREAS PRESENT AND FUTURE

Present

The waterfowl habitat situation in Louisiana is essentially the same as that outlined in the last Biennial Report. These facts are briefly reviewed in the sections that follow.

Louisiana has nearly six million acres of waterfowl habitat. About 450,000 acres of this total are in refuges. The state controls 180,000 acres of refuge, the federal government 240,000 acres of refuge and the National Audubon Society 26,000 acres. None of the state or Audubon Society refuge lands can ever be opened to hunting. Under a new law, portions of the federal refuges can be opened to public hunting if the government so desires.

Louisiana is presently managing seven areas as public shooting grounds for duck hunters. One of these areas was added only last year when 15,000 acres of land were purchased in the Lafourche bottoms near Monroe. The combined acreage of the shooting grounds now totals about 155,000 acres.

Development programs designed to maintain or improve the areas are in effect on all public shooting grounds.

The large impoundments (some of these are Lake Bistineau, Black and Saline Lakes, Turkey Creek, Anacoco and Iatt Lake) in the state provide additional hunting for many of the state's waterfowlers. The areas now support only small waterfowl populations and are not managed for waterfowl.

Catahoula Lake continues as one of the finest waterfowl areas in North America. This 21,000 acre basin produces a great quantity of food and in most years supports a large number of migrating and wintering waterfowl. The entire lake, except for two small refuges, is open to public hunting and is heavily utilized by hunters.

But Catahoula Lake is now endangered. A public controversy is raging over the location of a proposed lock and dam on Black River near Jonesville that can mean life or death for Catahoula Lake as a waterfowl area.

If this magnificent lake is to be saved the lock and dam must be located *above* the mouth of Little River that enters the Black River at Jonesville.

About a million acres of Louisiana's six million acres of waterfowl habitat is open to the public hunter. Much of this area supports few ducks and the kill there is often low, but the Louisianian who wants to hunt ducks can find a place to go.

Future

Great increases are forecast for both the state's human population and the state's industry in the years ahead and these changes may bring additional material gains to the people of our state. It is inevitable, however, that a part of these material gains will be collected only at the expense of a portion of the waterfowl habitat and public areas that remain.

How can we hold these losses to the minimum and insure waterfowl hunting as a sport in the years ahead? The program proposed two years ago is still good.

1. The first efforts should be directed toward preserving those good waterfowl areas that are in immediate danger. An example is the present threat to Catahoula Lake. Sportsmen should insist that the proposed lock and dam be located above the mouth of Little River.
2. Our greatest long term need is for close planning with the various agencies engaged in drainage, navigation improvement, and flood control. Often minor changes in plans can result in a project beneficial to wildlife interests or at the least reduce the possible damages to a minimum.

   In these large public projects emphasis should be placed on multiple use plans that can benefit all, rather than single purpose programs that frequently have little or no regard for recreational opportunities or fish and wildlife.
3. It has proved difficult in the past to purchase land in Louisiana at prices that could be justified for public hunting. But land values continue to rise and we are assured that future human populations will be much larger in Louisiana. Every effort should be made to acquire lands now even if management and development programs on these lands must be deferred for a period of years.
4. In lieu of purchase, long term leases can be obtained on certain lands. In the past this has often been the only way to acquire hunting areas. A lease is not as satisfactory as purchase but it has a place in public hunting programs.
5. State-owned lands now under lease to private individuals for hunting should be converted to public use when the leases in force expire. Public lands managed by

These ducks are in a holding pen for banding purposes.

A wary mallard drake flares away from the blind.

other state agencies should be examined to determine if public hunting would be compatible with present use. Where such seems possible, the matter should be discussed with the agency responsible for the management of the land.

6. Portions of the vast federal refuge system in Louisiana can legally be opened to controlled public hunting. The state should urge that the federal government consider opening a portion of these lands to the public. This would be a great help in southwest Louisiana where public waterfowl hunting is nil and the federal holdings are vast.
7. Opportunities exist for improved management of lands under control of public bodies. Particularly is this true of some of the large impoundments in the state. Annual fluctuations of water levels appear to be the best means of improved management for waterfowl and should benefit fishing, too.

This series of proposals would do much to provide opportunities for public waterfowl hunting in Louisiana in the years ahead.

But these proposals must be converted into a plan of action by the state's sportsmen if any benefits are to be realized from this program. The time to act is now!

SQUIRREL INVESTIGATIONS

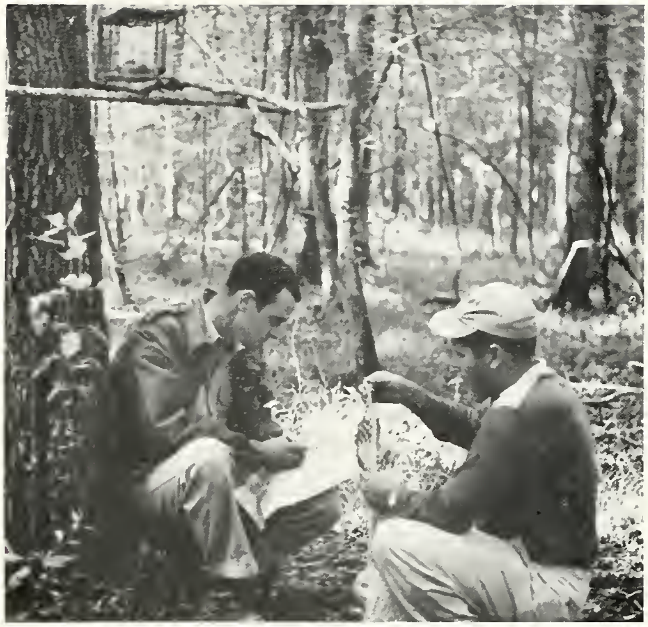
J. B. KIDD

Study Leader

TRAPPING AND TAGGING

In October of 1960 Dan Dennett, Biologist of the Louisiana Wild Life and Fisheries Commission, presented a squirrel research paper entitled "An Analysis by Tag Returns of Three Years Controlled Squirrel Hunting". This paper was authored by Mr. Dennett and the Study Leader and addressed to the Fourteenth Annual Conference of the Southeastern Association of Game and Fish Commissioners at Biloxi, Mississippi. This was the culmination of three years trapping and tag returns on the Grant-Rapides Game Management Area during the years 1957, '58 and '59. Data collected from this central Louisiana game management area, which is located in Fox squirrel habitat, indicated that hunters during the three years in question harvested approximately 15 percent of the total population annually. This tag return information was also applied in determining approximate total populations of the area.

Unfortunately, the trapping and tagging program on the Grant-Rapides area was halted in 1960 as the lease on the area expired and could not be renewed by the Commission. Since it was believed that the type of data collected on the Grant-Rapides area could provide valuable basic management information, it was decided to institute another trapping and tagging program on the Thistlethwaite area which is located in St. Landry parish.



J. B. Kidd, project leader, is shown with state biologist Larry Soileau, recording data on a squirrel that has been trapped, tagged, and released.

This management unit contains approximately 10,000 wooded acres within its boundaries and is primarily gray squirrel habitat.

Prior to the hunting season of 1961, 194 squirrel traps were put in operation. Problems not encountered before presented themselves during this operation which limited trapping success considerably. Approximately 300 wood rats were trapped during the operation. This pest consumed more bait than the squirrels and was a constant nuisance. Coon predation on trapped squirrels was also a problem that had to be coped with. A total of 24 squirrels were killed by coons. The problem was further complicated as some squirrels, devoured completely by coons, could not be identified either as a new animal with no tags or a retrap which had been previously marked.

When trapping was halted there were a maximum of 97 squirrels remaining with tags or a minimum of 90 squirrels which had retained their identification. These two figures are presented because coon had completely devoured 7 squirrels, leaving no indication as to whether the squirrels had been tagged or were not tagged.

During the hunting period 35 tagged animals were returned by hunters. This is a much higher rate of return than was experienced on the Grant-Rapides area. It is believed, however, that some bias was introduced in the operation which may have contributed to the high rate of return. Factors contributing to this bias may have been two fold: (1) tagged squirrels were concentrated in three specific areas and not evenly distributed throughout the whole area and (2) hunters after learning of tagged squirrels that were killed sought out the trapping areas and tried specifically to kill a tagged squirrel just for the novelty of killing a marked animal. It is intended to continue this trapping and tagging operation in the future, but adjustments will be made in the trap locations to eliminate the bias mentioned above.

HUNTER BAG CHECKS

Squirrel hunting success in 1960 on the game management areas reached an all time high exceeding all previous years of managed hunting. The total kill and the combined hunting success from all the areas was the best ever experienced. During the 1960 season 19,777 squirrels were killed as the result of 8,449 individual hunting efforts for an average kill per hunting effort of 2.34 squirrels.

Management areas were opened to squirrel hunting in 1961, but there were only two areas, West Bay and Thistlethwaite, in which daily hunting permits were required and the exact kill determined. On the remaining game management areas one season permit was issued which was good to hunt squirrels during the period October 7-28.

Table I

MANAGED SQUIRREL HUNTS BY PERMITS ONLY

1960

Area	*No. Hunts*	*No. Squirrels Killed*	*Avg. Kill Per Hunting Effort*
Catahoula	866	2,597	2.99
Thistlethwaite	2,099	5,776	2.75
Union	400	1,090	2.73
Jackson-Bienville	1,195	2,826	2.36
Evangeline	138	160	1.16
Caldwell	216	504	2.33
Chicago Mills No. 1	461	839	1.82
Chicago Mills No. 2	626	1,063	1.70
West Bay	2,448	4,922	2.01

1961

Thistlethwaite	1,819	4,376	2.40
West Bay	4,454	10,095	2.26

MOURNING DOVE INVESTIGATIONS

LAWRENCE D. SOILEAU

Study Leader

During the past two years the major efforts of the dove study have been directed toward gathering management data in an effort to more realistically harvest the mourning dove. Hunting seasons must be manipulated and bag limits regulated to the annual production and overall dove population, for no other management tools have yet been developed for the mourning dove.

A measure of production and the season in which this production occurs are needed to assist in formulating hunting regulations. In order to determine the nesting season of the dove in at least one area in Louisiana, an intensive nesting study at Baton Rouge was initiated in cooperation with the game department at Louisiana State University. Complete nesting records were kept on 396 nesting attempts during three nesting seasons. The average number of young fledged by month is indicated in Table I. On the study area over 67 per cent of the young were produced during May, June and July while 6.8 per cent were fledged during September in spite of an open hunting season during that month.

During the past two years two census methods were used in an effort to determine trends in the statewide dove population. These were the random road count, a count of all doves seen by biologists during year-round daylight driving, and the call count, a nationwide count of cooing doves along permanent routes censused once annually between May 20 and June 10. While these census methods do not give us a total dove population count, they do give an index figure which may be compared with the previous year's index to determine a trend in the population. The 1961 indexes obtained from 17 call count routes and the random road count covering approximately 18,000 miles per month indicate a decrease in the statewide mourning dove population from the 1960 level.

During the past two years trapping and banding has been restricted mainly to permanent stations. The banding of nestling doves provides much useful information, but is a very time consuming job. During 1960 a total of 65 nestling doves were banded throughout the state, and 53 in 1961 for a total of 118 during the two year period. During the summer of 1961 in addition to banding, throat swabs of the nestlings were taken and sent to Patuxent Wildlife Research Center for analysis as part of the national cooperative dove disease surveillance program. The banding of flying adult and immature doves with baited wire box traps is listed below.

Location	*1960*	*1961*
Selman Field, Monroe	432	281
Camp Claiborne, Alexandria	179	491
Ft. Polk, Leesville	0	116
Grand Terre Island	174	294
Other	16	1
TOTAL	801	1,183

For the past several years a major effort has been made to obtain more information concerning the dove population segment which migrates through the Gulf Coastal islands in late October and early November. Maximum trapping success for the past two years has been between October 15 and 20 which seems to mark the peak of migration through this area. The few reported hunter kills of doves banded on Grand Terre Island thus far received indicate an eastward migration of this population segment into Mississippi, Alabama, and Florida. The nesting area of at least some of these birds may be far to the north as indicated by the report of an immature dove banded on Grand Terre on October 22, 1959 which flew into a pigeon coop at Aylmer, Ontario, Canada on August 28, 1961.

One of the foremost needs in the over-all dove management program is the development of a method to reliably estimate hunting pressure and harvest over the dove hunting regions. This need has long been recognized by dove researchers throughout the country. In October, 1959 the report of investigation into this problem sponsored by the Wildlife Management Institute, the Wilder Wildlife Foundation, the U. S. Fish and Wildlife Service, and the North Carolina Institute of Statistics was published. At its April, 1960 meeting the Dove Committee of the Southeastern Section, Wildlife Society, recommended that Louisiana and Tennessee, with the Institute of Statistics, North Carolina State College, cooperating, field test on a parish basis the "area-time" field sampling frame (hunter bag check) and the telephone interview as methods of estimating dove kill and hunting pressure.

The "area-time" field sampling frame was tested in Acadia Parish during the 1960-61 dove hunting season by the dove study leader and other research biologists. In essence, the purpose of the "area-time" field sampling of dove hunters is to check the bags of hunters for a defined time period utilizing randomly selected areas and hours of the day for each sampling day. The total kill can then be detemined by expanding this sample to the total of dove hunting area and the total time that doves can be hunted during the season.

In addition to kill data, that portion of hunters contactable by telephone was determined during the course of the field hunter interview. This information is necessary for the use of the telephone frame as a means of estimating dove harvest.

The telephone interview method was investigated using the Rayne and Eunice exchanges. This portion of the study was directed by Mr. Herbert Stern, Jr., leader, Project FW-2R. All data gathered during these investigations was sent to the Institute of Statistics, North Carolina State College for analysis.

It should be pointed out that the field testing accomplished during this study was basic research on methodology and not an attempt to estimate kill on even a parishwide basis.

Table I

PRODUCTION OF NESTING DOVES BY MONTH

March	1.4%
April	13.6%
May	22.2%
June	21.3%
July	23.6%
August	11.1%
Sept.	6.8%

RABBIT INVESTIGATIONS

JACK O. COLLINS

Study Leader

The importance of rabbits as a game animal in Louisiana has increased at such a rapid rate during the past decade that it now ranks near the top in a comparison to deer, squirrels, waterfowl, and others. This is especially true from central Louisiana southward. Sportsmen from throughout the state are desirous of more information about the two species, cottontails and swamp rabbits, that are native to Louisiana. Not only for these reasons but also because of the shrinking natural range and restricted hunting privileges the need for concentrated studies on both cottontails and swamp rabbits became apparent. For the proper management and harvest

Weighing cottontail rabbit on rabbit research area in Morehouse parish.

of any game species certain basic facts are necessary. Some of these are known; but some remain unanswered at this time.

Research on cottontails and swamp rabbits was started in July, 1952. However, the project has undergone much change since its inception. Most of the original jobs were reported on and discontinued prior to January, 1960, the date at which this report begins. It encompasses work carried on in 1960 and 1961.

Three main objectives were included in the study as follows: (1) To obtain an index to population trends, (2) Trapping and tagging of both species to gather information on trapping techniques, movements, and certain other basic data, and (3) Harvest trends by means of hunter bag checks.

Population or activity trends are determined each month of the year in the eight administrative districts of the Pittman-Robertson section, Fish and Game Division. The work is assigned to all biologists of the P-R section. The following method is used to obtain the data which is analyzed by the study leader at the end of each month.

When traveling to perform routine duties the driver records the number of dead and live rabbits observed. Also, the speedometer reading is recorded at the beginning and completion of each trip. This information is kept only during daylight hours and by day, month, and year. Calculations are made on the basis of the number of rabbits observed for each 100 miles of travel. Based on this data there was little or no change in the rabbit population on a state-wide level during the past three years. From July, 1960 to July, 1961 the index figure was 0.69. It was almost identical to the two previous years when 0.70 rabbits were observed for each 100 miles traveled.

Trapping and tagging of cottontails and swamp rabbits was conducted on two forty acre study plots in Morehouse Parish from the fall of 1957 through the spring of 1961. Actual trapping, however, was confined to the winter and early spring months of each year. Trapping techniques that were developed on these areas proved very successful, 25 wooden box traps were used on each area during the entire trapping operation. Over the four year trapping period several different kinds of bait were tried. In this experiment vanilla extract, green onions, sweet potatoes, and apples were used. The only traps in which rabbits were captured were baited with apples. To insure freshness baits were changed every other day. At the time of trapping a numbered tag was placed in each ear of every rabbit caught. Each animal was also weighed, sexed, and released at the trap site. From these studies some information on movements, sex ratios, weights, and other pertinent data were gathered.

Four young rabbits burrow in nest which was noted in Ouachita Parish.

Between November 10, 1959 and May 27, 1960, a total of 55 swamp rabbits and 16 cottontails was tagged. In addition 16 swamp rabbits and 3 cottontails tagged the previous year were retrapped at least once. Whereas, between October 28, 1960 and April 7, 1961, 29 swamp rabbits and 14 cottontails were caught. Four swamp rabbits and one cottontail tagged prior to October 28 were retrapped.

In 1959-60 the average adult swamp rabbit weighed approximately 74 ounces. But for the trapping period of 1960-61 it was 70 ounces. Adult cottontails trapped in 1959-60 weighed about 30 ounces.

For both years slightly over half the rabbits trapped were females.

In 1959-60 the distance traveled between traps in which they were caught averaged 170 feet for swamp rabbits. This was less than the cruising radius which was 288 feet in 1960-61. For cottontails the cruising radius averaged 259 feet in 1959-60 and 333 feet in 1960-61.

Trapping of swamp rabbits will be started on the Thistlethwaite Game Management Area in St. Landry Parish where adequate controls can be maintained. The work will begin about December 1, 1961. Throughout its normal range only a minor amount of research has been conducted on swamp rabbits. As a result much basic data is needed and emphasis will be placed on this fact at Thistlethwaite. The work was discontinued in Morehouse Parish because hunting and other activities on the study plots could not be closely supervised since the land was privately owned.

A necessary tool in the proper management of any game species is to have available some knowledge about harvest trends on a year to year basis. Although small in number a few hunters have been cooperating in this endeavor for the past several years. Annually, these hunters keep records on their hunting efforts. They record the number of hunters participating and the number of rabbits bagged on each hunt. During the season of 1959-60 cooperators reported 1,074 participants in 332 hunts. The average number of rabbits killed per hunter per hunt was 1.28. In the hunting season of 1960-61 a total of 993 hunters took part in 361 hunts. The number of rabbits bagged by each participant was 1.53. However, this sample was considered too small to provide data on state-wide harvest trends. As a result in September, 1961, a concentrated effort was made to increase the number of cooperators.

Through personal correspondence approximately 400 members of various beagle clubs in Louisiana were contacted and asked to assist in an undertaking of this type for at least three years. To date, about 125 individuals from all over the state have replied and indicated a willingness to contribute information on their hunts. With this size sample of rabbit hunters adequate material will be available to determine state-wide indices.

With the increased emphasis and scope being placed on rabbit research it is anticipated that proper rabbit management can be accomplished.

OAK MAST AND T.S.I. INVESTIGATIONS

JACK O. COLLINS

Study Leader

For generations, acorns have been recognized as a very important food for many forms of wildlife and domestic livestock. Not only in the management of timberstands especially in the piney-wood regions of Louisiana, but also in the management of wildlife populations certain basic facts about oaks and their mast productive characteristics were needed. These needs became apparent to the wildlife technicians and foresters of the state in the late 1940's. Consequently, in 1950 the Federal Aid section of the Fish and Game Division, Louisiana Wild Life and Fisheries Commission initiated a study on several oak species. It was originally intended to gather information primarily on "scrub oaks", that included post oak, blackjack, southern red, and sandjacks, but in 1955 the project was expanded for the purpose of finding out more about the major bottomland oaks throughout the state and increasing the scope of the upland oak study. At first, study plots were on the Red Dirt and Catahoula Game Management Areas. Both are on lands of the Kisatchie National Forest. Red Dirt is in Natchitoches Parish, and Catahoula is in the parishes of Grant and Winn. At the time of expansion new areas selected for study were comprised of the following: Jackson-Bienville Game Management Area in District I, Union and Morehouse Parishes in District II, Concordia Parish in District IV, West Bay Game Management Area (Allen Parish) in District V, Thistlethwaite Game Management Area (St. Landry Parish) in District VI, and Iberville Parish in District VII.

Oaks selected for study were the ones that occurred most frequently in the timber stand where the check plots were selected within each district. Bottomland oaks from which data was obtained were water oak, willow, nuttall, obtusa, white, cow, and overcup. Along with the upland oaks previously mentioned these make up the major oak species of Louisiana.

Objectives of this investigation were: (1) to determine mast yields and any cyclic production characteristics that the oaks may have, and (2) to correlate mast production with tree crown size, bole diameter, age, tree stand densities, and timber management practices.

Acorns are recognized by most everyone as an important wildlife food. However, in some cases too much emphasis is placed on them; in others, there is a lack of understanding about the value of this seed crop. A good supply of acorns provides not only quantity but also high quality food for deer, squirrels, quail, turkey, waterfowl, hogs, many kinds of birds, coons, other rodents such as rats and mice, plus many other kinds of animals too numerous to mention here.

Just get around a group of deer hunters, and it won't take you long to find out their opinion about acorns as deer food. It is all important, they say. Certainly, this is true while the acorns last, but even on bumper crop years they are not available in quantity for over six months of the year. But bumper crops are infrequent and on some years there are almost total mast failures. Deer are a browsing type animal; that is, they obtain most of their food by nipping current growth from various understory plants. Hence, deer herds in Louisiana must be managed on the basis of available browse supply on a year-round basis.

Perhaps the biggest advantage of a good acorn crop is the fact that it takes pressure off the browse plant species during the critical winter months since deer will utilize little else when the acorns are there, and it helps to keep a deer in good physical condition during the cold winter months.

For some animals such as gray and fox squirrels acorns are an essential part of the diet. A squirrel will not starve when acorn crops fail, but it is not in good breeding condition. It has been found that squirrels are in abundance the year following a good mast crop. From this, it is apparent that oaks are necessary in a timber stand if the maintenance of a squirrel population is desired.

A controversy between sportsmen, foresters, wildlife technicians, and others has existed for the past decade about the problem of Timber Stand Improvement better known as T.S.I. in the piney-wood regions of Louisiana and other southern states. The expression "T.S.I." refers to the removal of an undersirable species from a timber stand. Economic values forced the timber manager in the upland regions of the state to place great emphasis on the growth of more pine. On the other hand the "scrub oaks" have had little or no economic value, but they compete for soil nutrients, sunlight, moisture, and space. Because of this the oaks have been and still are being removed from the stands by girdling, poisoning, aerial sprays, and other means. Some landowners were willing to leave oaks in the pine stands but were unable to answer such questions as how many to leave, what kind, what age, what size, and other related questions.

Probably the most important point that should be brought out is that all hardwoods should be left along the stream bottoms because this is where oaks grow best and pine is hard to establish.

Although the practice of T.S.I. is increasing in the bottomland hardwood regions it is no problem but an advantage because good hardwood management automatically becomes good wildlife management when understory vegetation is left in the stand. In managing for better hardwoods trees favored are those that exhibit healthy vigorous growth with well developed crowns and good form. Generally, these type trees are also the best mast producers.

These oak mast and Timber Stand Improvement studies were completed in 1960 and a final report was written.

Some of the findings are presented below:

(1) Size of acorns vary greatly. A wide range exists within a species from one locality to another and even in the same locality from tree to tree. Also, the size range often varies from year to year on the same tree.

(2) On a one acre scrub oak plot on the Red Dirt Game Management Area the average number of pounds of air-dried acorns produced was 78 for the ten year study period (1950-1959).

(3) Bottomland species produce more pounds of acorns per tree than upland oaks. Floodplain oaks yield more mast than those inhabiting smaller stream bottoms. From the standpoint of mast production water oak is superior to that of any other species in Louisiana.

(4) Tree species in the red oak and white oak category usually complement each other in a given year insofar as yields are concerned. That is, on years when mast crops are low on white oaks they are good to high on red oaks and vice versa.

(5) Individual trees exhibit consistency in their manner of production. Good producers generally yield large acorn crops, and poor producers small crops.

(6) All trees of mast bearing size and age do not produce acorns every year. Emphasis should be placed on the fact that only 68 percent of all trees over 10 inches in diameter were productive during the course of the study. Over the entire state red oaks had a higher percent of productive trees than white oaks. Percentagewise, for red oaks it was 79; for white oaks it was 52.

(7) Yield measurement data indicate that oaks are cyclic in their mast producing habits. Generally, species in the red oak category, blackjack, sandjack, water, willow, nuttall, obtusa, and southern red, show a cyclic trend of six years. Although peak crops do not occur but about once every six years, good yields occur every one to two years apart. The white oak group that includes postoak, white, and cow oak seem to have a three year cycle with poor to negligible crops in between. For overcup oaks a cyclic trend of more than five years is suggested.

(8) Abnormally late spring freezes may entirely eliminate or considerably decrease a mast crop on trees in the white oak group the same year it occurs and two seasons, hence, on trees in the red oak group. If a freeze occurs when oaks are in full bloom it is obvious that much or all of the potential seed or nuts would be destroyed. Difference in time of seed failure between the two groups of trees lies in the fact that white oaks mature fruit in one growing season, and red oaks require two growing seasons to mature acorns.

(9) Minimum age at which substantial acorn yields can be expected is 25 years.

(10) Usually a good mast crop cannot be expected on trees with less than a ten inch diameter.

(11) Crown size is the greatest single factor affecting acorn yields. Best producers are those oaks in the larger diameter classes with well-developed crowns.

(12) Wide variations in the percent of sound acorns are common within a species from one locality to another. This same situation exists between species. On an overall basis 65 percent of all acorns examined were sound. White oaks usually showed a higher percent of sound acorns than red oaks. Most unsound acorns in Louisiana are a result of weevil infestation.

(13) A chemical analysis showed acorns were high in carbohydrates and relatively low in protein content.

(14) Over 20 percent of all mature acorns never reach the ground. They are consumed by arboreal feeders, mostly birds and squirrels.

(15) Average number of pounds of acorns per tree calculated for all species during the entire period of study was as follows: water oak—18.44, willow oak—6.05, obtusa—1.70, nuttall—13.07, southern red—2.91, blackjack—5.10, sandjack—0.93, white—4.71, cow—3.71, post—2.62, and overcup oak—7.01 pounds. Yields on sandjack are presented on trees with diameters above 6 inches. For the others diameters were ten inches and above.

For many reasons in a general discussion on oak management it is impossible to make exact statements about how many trees of various sizes should be left in a timber stand to supply a sufficient quantity of acorns for wildlife. Some specific questions that need to be resolved first are (1) major oak species in the stand, (2) degree of emphasis to be placed on wildlife management, (3) species of animals concerned with in the plan of management, (4) degree of emphasis to be placed on timber management, and (5) type forestry management to be practiced.

On public lands under state and/or federal supervision considerable emphasis should be put on the management of oaks not only for wood uses but also for the benefit these trees offer wildlife as producers of food and cover.

From the viewpoint of wildlife management a good food species is one that yields abundantly every year. Although no species of oak meets this qualification water oak most nearly fits in this category. It bears a good seed crop every one to two years apart. Nuttall oaks consistently yield large crops of sound acorns. Post oaks are the lowest producers. In game management practices careful consideration should be given to the fact that only 68 percent of all trees of all species were productive. The amount of acorns damaged by insects is also an important factor.

Wildlife managers should attempt to have a variety of species in the stand so that a complete mast failure will be unlikely. Oaks in the red and white category usually complement each other from the standpoint of production.

In conclusion, this data on the eleven most important oak species in Louisiana relative to their mast bearing capacities can be of great benefit to the forest and game manager. For any specific area sufficient factual data was compiled and is available so that it is now possible to make definite decisions regarding oak management in the southern pine or bottomland timber types.

Herbert Stern, Jr., Project FW-2R leader.

RESEARCH DESIGN, MACHINE COMPILATION AND ANALYSIS OF DATA—PROJECT FW-2R

HERBERT STERN, JR.

Project Leader

Federal Aid Project FW-2R, a joint Pittman-Robertson and Dingell-Johnson Project, was initiated on July 1, 1959 having the following broad objectives:

(1) Determine the feasibility of the use of punch cards for various fish and game research studies.

(2) Design punch cards and data collection forms.

(3) Supervise the punching and machine tabulation of research data.

(4) Determine the feasibility of electronic computer use in mathematical problems associated with research.

(5) Plan electronic programming with the aid of various study leaders and electronic machine representatives.

(6) Advise in the planning and design of research jobs and the statistical analysis of research data.

(7) Serve as liaison between the various study leaders and the Cooperative Statistical Project, North Carolina State College.

Work reported on in the 8th Biennial, which included the first six months of the Project's existence summarized only preliminary work loads.

During this biennium, a considerable number of programs was designed for data processing, routine processing was developed for certain continuous jobs, backlog data accumulated over previous years were placed on machine records and aid was given to several research study designs. In addition, the Project cooperated with Tennessee and North Carolina State College in a basic research study on mourning dove hunter harvest.

Since Project FW-2R is primarily a "service" project, reporting on most data processed is a responsibility of the various study leaders requesting the work and will be found elsewhere in this Biennial Report.

Following is a breakdown of the jobs and the type work performed by this project during 1960 and 1961.

Bird Banding

The Commission's bird banding program is coordinated by Project FW-2R. Functions of the banding program controlled by this project include:

(1) Recommendation to the U. S. Fish and Wildlife Service of permit holders operating under the Commission's master permit.

(2) Maintenance of an adequate number of bands and issuance of these bands to persons conducting banding operations; the cataloging of these bands and periodic band audits; and reassignment of bands when necessary.

(3) Reports to the U. S. Fish and Wildlife Service on monthly banding operations.

(4) The design of a field banding form to be used by banders.

(5) The development of a machine processing system to handle collection, recording and reporting of the banding program.

(6) Tabulations and summaries prepared periodically or as requested of any phase of the banding program.

(7) Aid in analysis of banding results.

Banding reports and analyses generally follow four basic breakdowns: (1) The original banding, (2) Retraps, (3) Returns and (4) Recoveries.

Retraps differ from returns by the length of time between trapping and the location of retraps in relation to original banding. Recoveries generally relate to banded birds which have been killed.

The designs of the processing system were completed during 1960 and now banding is routinely processed each month that banding is carried out. It was also necessary to place on punched cards all banding data on which records were available from 1949.

Backlog work, which was considered between the time periods 1949—October, 1959, was first to be placed onto punched cards. This phase was divided into three sections (a) original banding, (b) retraps and (c) recoveries. Work on banding and retraps has been completed; however, the recovery work has been delayed because of a fire at the U. S. Fish and Wildlife Service's Patuxent Research Center where all recovery records are housed. Recovery work on banded waterfowl and verification of mourning dove recovery data has been initiated. It is hoped that a generalized banding report will be prepared during the next biennium.

Key punch operator, Mrs. Marilyn Taylor, punching banding cards.

Data processing procedures follow a general pattern, whether for banding or for other programs. This pattern is outlined below utilizing the banding program for illustrative purposes.

(1) When data processing of a program is requested, a system is programmed by the Project Leader considering the objectives of the requesting study and the most flexible machine program to accomplish these objectives. The phases considered here take into account the design of a field recording form, the design of machine cards into which the field information is punched, a processing system involving sorting and tabulating of recorded data, summaries necessary and a computing program involving a Univac computer if needed.

(2) Once the entire system is set up, data processing begins at specified intervals with an audit and coding of field forms received from the research study involved. For banding, each month of banding operations is routinely processed.

(3) After the field forms (source documents) have been coded and audited an operator punches a machine card for each entry.

(4) Another operator verifies the work by repunching the same information onto each card. Verify punch holes are slightly off below the original punch hole.

(5) Any card in which a punch hole and verify punch hole is not matched will draw a "flag" card when put through a verifier machine. This is one method to eliminate errors in punching.

(6) After verification, the cards are put through an interpreter and the results of the punched holes are printed above each column of punching.

Tab equipment operator, Mrs. Ruby Guerin, listing banding data on the tabulator.

(7) The cards are then ready to be sorted into various breakdowns and the results of sorts printed by the tabulator.

(8) When requested breakdowns and summaries or analyses require large numbers of computations a Univac 120 is used to compile the results swiftly and accurately.

Current banding operations will be reported on by the Waterfowl and Dove Study Leaders under Pittman-Robertson Project W-29R. A detailed discussion of the banding program is due in a separate report in the near future.

Big Game Licensing System

With the advent of a big game licensing system during the 1960-61 hunting season which required that all persons who hunted deer and/or turkey secure a special license, tag all kills and report each kill to the Commission, it was necessary to develop a system of collecting and processing hunter reports of kills—an assignment to Project FW-2R.

Programming was completed to include all phases of the reporting system: (a) Handling, auditing and coding report cards, (b) punching and verifying machine cards, (c) tabulating results, (d) estimating by a limited survey the hunter non-response rate and (e) reporting results.

For the 1960-61 hunting season a final report entitled "Hunter Reporting Results, Deer and Turkey Licensing System" was prepared. It is impossible to reproduce this report here; however, certain tables might be of interest and are included (Tables 1 & 2).

Because the licensing system changed somewhat for the 1961-62 season, certain revisions were made in the processing of reports. Hunters now are required to report their season results regardless of their kill. If this reporting is successful we will be able to determine in addition to the number of hunters who killed deer, the number who bought licenses but did not hunt and the number of hunters who hunted but were unsuccessful. Since the 1961-62 hunting season is still in progress at the writing of this report, results will appear in a future publication.

Table 1

HUNTER REPORTS OF DEER KILL BY PARISH

Parish	*No. First Deer Killed*	*No. Second Deer Killed*	*Combined Totals*
Allen	84	......	84
Ascension	28	......	28
Assumption	89	11	100
Avoyelles	108	4	112
Beauregard	35	......	35
Bienville	59	4	63
Bossier	38	5	43
B.A.F.B.*	132	8	140
Caddo	54	3	57
Calcasieu	9	......	9
Caldwell	140	5	145
Catahoula	56	5	61
Claiborne	68	4	72
Concordia	484	30	514
DeSoto	18	3	21
E. Carroll	293	17	310
E. Feliciana	1	......	1
Evangeline	20	3	23
Franklin	49	4	53
Grant	136	3	139
Iberia	17	7	24
Iberville	117	6	123
Jackson	98	2	100
Jefferson	15	......	15
Jeff. Davis	1	......	1
Lafayette	1	......	1
Lafourche	15	1	16
LaSalle	21	1	22
Lincoln	12	1	13
Livingston	22	2	24
Madison	519	55	574
Morehouse	233	15	248
Natchitoches	96	4	100
Ouachita	3	......	3
Plaquemines	30	6	36
Pt. Coupee	83	9	92
Rapides	76	7	83
Red River	5	1	6
Richland	51	2	53
Sabine	98	3	101
St. Bernard	13	2	15

---

*Barksdale Air Force Base.

Parish	*No. First Deer Killed*	*No. Second Deer Killed*	*Combined Totals*
St. Charles	14	-----	14
St. James	66	9	75
St. John	63	10	73
St. Landry	43	1	44
St. Martin	39	1	40
St. Mary	15	1	16
St. Tammany	40	1	41
Tangipahoa	33	1	34
Tensas	953	122	1,075
Terrebonne	38	2	40
Union	99	4	103
Vermilion	21	2	23
Vernon	43	4	47
Washington	36	-----	36
Webster	25	1	26
W.B.R.	8	-----	8
W. Carroll	17	1	18
W. Feliciana	34	2	36
Winn	109	2	111
Unknown	1	4	5
Totals	5,124	401	5,525

Table 2

HUNTER REPORTS OF DEER KILL ON GAME MANAGEMENT AREAS

Parish	*No. First Deer Killed*	*No. Second Deer Killed*	*Combined Totals*
Catahoula	56	1	57
Chicago Mills	596	27	623
Evangeline	135	7	142
Ft. Polk	1	-----	1
Jackson-Bienville	66	2	68
Red Dirt	159	2	161
Sabine	2	-----	2
Union	3	1	4
West Bay	224	4	228
Zemurray Park	36	3	39
Totals	1,278	47	1,325

Cooperative Wildlife Statistical Project

The Cooperative Wildlife Statistical Project was approved by the Southeastern Association of Game and Fish Commissioners in 1959 with working agreements among nine states including Louisiana. Broad basic objectives of the project include: (1) To field test and evaluate theoretical statistical findings in designs and analyses and (2) Provisions for statistical consulting by member states.

The Cooperative Project operates from the Institute of Statistics, North Carolina State College, and now employs one full time representative (Project Leader) and two graduate assistants.

Louisiana Project FW-2R acts as coordinator between the Fish and Game Division research personnel and the Cooperative Project. Problems of a statistical nature that need exploration are submitted to the Institute of Statistics for study and recommendations. Some problem types which have been submitted during the biennium include: (1) Sampling design, Lake St. John creel census; (2) License duplication analysis and (3) Thistlethwaite G.M.A. squirrel trapping study. In addition, five other problem areas have been discussed at North Carolina State which were exploratory in nature.

In addition to our consulting time, Louisiana along with Tennessee aided in testing theoretical research work relating to estimates of mourning dove kill during 1960 and 1961. Dove researchers have long wanted a reliable method of estimating kill of the species. Several possible methods were explored in a theoretical nature by the Institute of Statistics; however, there remained much need to test these methods in the field and to analyze results.

It was felt that a telephone survey system and a time-area system of checking hunter bags deserved primary consideration in evaluation and these methods were selected for a pilot study conducted in Acadia Parish and on the Rayne and Eunice telephone exchanges.

This was the first time telephone interviews had been utilized as a means of estimating hunter kill and much work time was spent in exploring the system, hiring interviewers, collecting data and summarizing findings for analyses. Also, research biologists conducted examinations of hunters' bags throughout Acadia Parish during each of the dove seasons, checking designated areas at specific time intervals.

Results of the pilot study are being analyzed at North Carolina State College and a report is due early in 1962. Two publications were written on the methodology of the field work: (1) Investigations Towards A Reliable Method for Estimating Dove Kill 1960. Proc. 14th Annual Conf., SE Assoc. of Game and Fish Commissioners (in press); and (2) A Preliminary Evaluation of Telephone and Field Sampling Frames 1961. Trans. 26th North American Wildlife and Natural Resources Conference pp. 405-416.

Designs and Analyses

Work under this heading can be broken into the following sections: (1) Designs for data processing procedures, (2) Designs for research sampling and (3) The plans for and analysis of results of processed or sampling data.

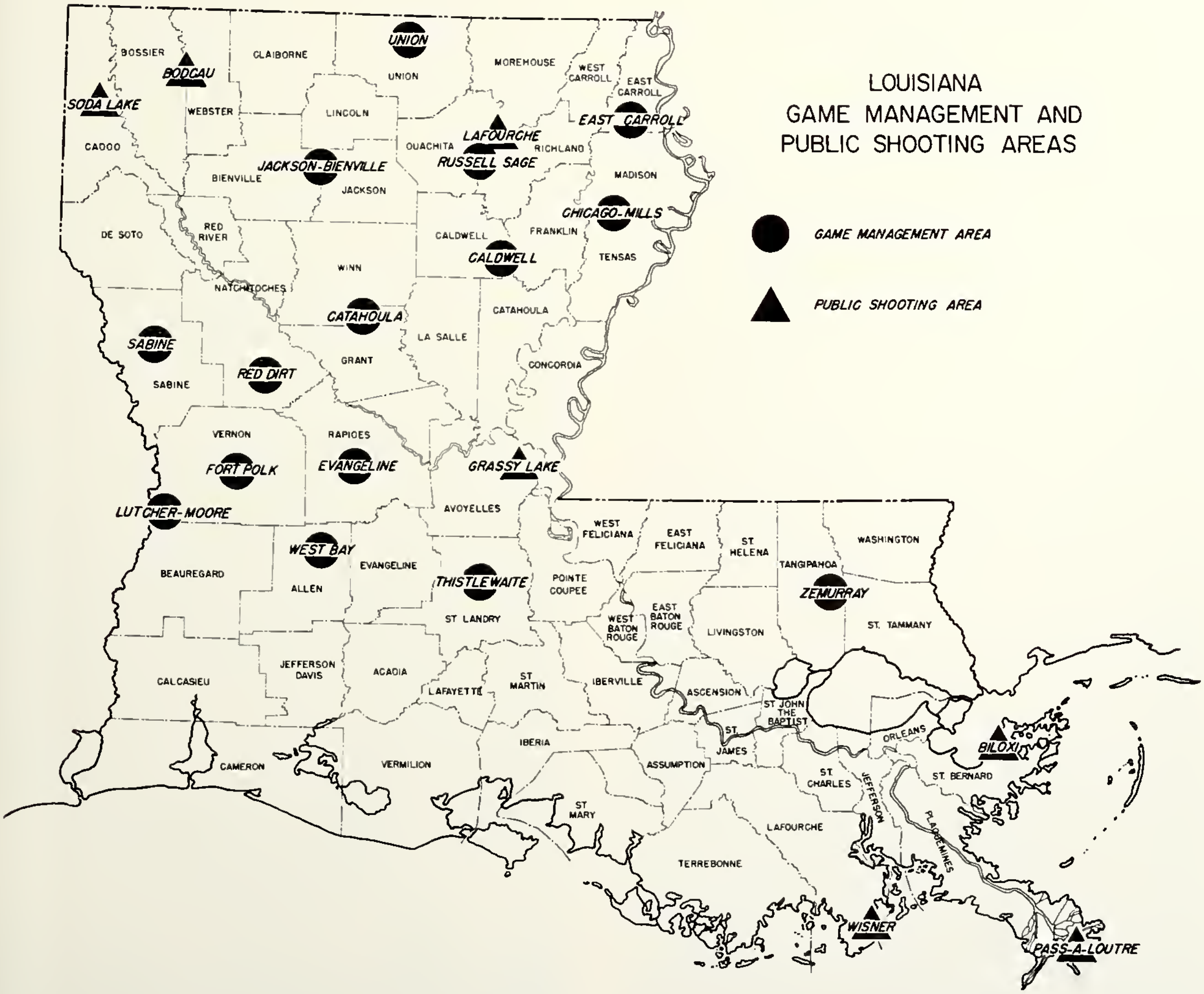
In designing programs for data processing our first phase is to determine the feasibility of the program for machine processing. If the program is feasible and within the capabilities of the Project, detail planning such as discussed under the bird banding section is begun.

During the biennium the following planning was carried out with views to placing data onto punched cards: (1) Fish sampling (Dingell-Johnson Projects F-5R, F-7R, and F-8R); (2) Game Management Area deer kill (Pittman-Robertson Project W-29R) and (3) Age-Sex-Weights of Waterfowl killed by hunters (Pittman-Robertson Project W-29R).

Routine Data Processing

After programming a system for data processing, routine procedures are set up and followed during the remainder of processing periods for each program. For example, Project FW-2R processes creel census field data now being carried out by Dingell-Johnson Project F-7R. Since routines have been established for this processing, no special or continued programming is needed and material is processed as we receive it.

At certain intervals of time, project and study leaders might need a particular series or group of data summarized or presented in a specified manner. When this is requested, the data on punched cards are sorted and necessary results listed on the tabulator. If the requests warrant computations which cannot be obtained by the tabulator, a Univac 120 is used. This type of work is done for creel census data of Dingell-Johnson Projects F-1R and F-8R; for banding data of the mourning dove and waterfowl; and for fish age and growth data, Dingell-Johnson Project F-10R.



HARRY SCHAFER, JR.

Fisheries Section

HARRY E. SCHAFER, JR.

Supervisor

The Fisheries Section during the past two years received funds for carrying out its projects from two sources. First, money was allocated to the section from the Louisiana Wild Life and Fisheries Commission's annual budget. These monies support research, managment, development and maintenance projects. Secondly, money is received by the section from the federal government under the Dingell-Johnson program. This money, which is derived from a federal excise tax on fishing tackle, is allocated to the states based on the number of licenses sold and on land area. Once again Louisiana did not receive its fair share of federal money because of our liberal fishing license requirements. The federal monies received support our fisheries research projects.

During this two year period, three Dingell-Johnson projects have been completed and final completion reports have been published. The report on the third one is now being prepared. The completed projects are: "An Ecological Survey of Factors Affecting Fish Production in Louisiana Water"; "Fish Population and Aquatic Conditions in Polluted Waters in Louisiana"; and "Fish Population Investigations". Copies of these reports are available from the Commission office.

Three new Dingell-Johnson research projects were initiated during the last biennium. One we think is significant because it is the first sport fisheries project in the coastal waters. The other two equally important projects are entitled: "An Ecological Survey of Factors Affecting Fish Production in River and Backwater Area" and "Age and Growth Studies". The latter project will give information essential to the management of fish populations. The former project will give valuable information on the changes in fish population due to a river channel realignment.

During the last two years, the fish hatcheries were modernized. The Monroe hatchery was completely renovated and new holding sheds with eight large holding troughs were constructed. Beechwood hatchery was equipped with a new water supply system and a drainage system. A holding shed and hatching troughs were constructed at Lacombe hatchery.

The water level in three lakes was fluctuated, partly as a fish management plan and partly for aquatic weed control. It is heartening to see that the public is accepting the fishery biologist's recommendations more and more. Also, in one lake the entire fish population was removed because of the large number of undesirable fish. This lake will be restocked with the correct number and species of game fish. In one lake a selective kill of shad was accomplished.

A new bioassay laboratory was constructed, thus intensifying the bioassay project.

The other two new projects are entitled "Primary Productivity" and "Fish Parasites". In the productivity project, we are trying to correlate the production of microscopic plants to the production of fish. Personnel of the fisheries section are working jointly with Loyola University on the fish parasite study. Fish are collected from all the watersheds and returned to the laboratory for inspection of parasite infestation. This is a three year study that is financed by a grant from the Department of Health, Education, and Welfare. One year of the project has been completed and a preliminary report on the findings is forthcoming.

Two fishery biologists were employed during this biennium. One was assigned to the District VIII office in New Orleans working as assistant project leader on the coastal water fishery project. The other fishery biologist was assigned to the District VI office in Opelousas as district fishery biologist and project leader of the Cypremort Point project. This biologist will also work on a pre-impoundment study of Toledo Bend Lake.

A more detailed report on the activities of each project follows.

FISH HATCHERIES

SAMMY STOKES

Biologist

The Louisiana Wild Life and Fisheries Commission owns and operates three fish hatcheries within the state of Louisiana. Their names and locations are as follows: Monroe Fish Hatchery,

Fisheries personnel seining fish for distribution from collecting pen after the draw-down of a fish hatchery pond.

Removing fish from the hatchery pond to be stocked in lakes.

Monroe; Beechwood Fish Hatchery, Alexandria; and Huey P. Long Fish Hatchery at Lacombe.

Repairs and construction work began in 1955 at the Monroe hatchery. Work was disbanded in 1956 until December 1960 when it was resumed and carried on through July, 1961. The only work that remains is the completion of the holding shed. This should be completed by January 1, 1962.

Beechwood Fish Hatchery was almost completely renovated beginning during the summer of 1959 and continuing until July, 1960 when it was completed.

There was only a small amount of repairs at the Lacombe Fish Hatchery but a much needed holding shed was constructed in January, 1961.

With construction and repairs almost completed at the three fish hatcheries the rearing and harvesting operations should be much more economical and efficient. Our primary goal in fish production is producing a quantity of fish as economically and efficiently as possible.

Needless to say, fish production was severely reduced during the previous biennum due to repairs at the Monroe and Beechwood Fish Hatcheries.

The Monroe Fish Hatchery did not get a bass spawn during the spring of 1960 due to reasons unknown. There were approximately eight spawns of channel catfish during the spring of 1960 but there was almost 95% mortality due to improper handling and rearing facilities. When work toward completion of the hatchery resumed in December, 1960 and continued through the following July and production was cut out altogether except for channel catfish. Approximately 75,000 channel catfish fingerlings were transferred from the spawning pond to rearing ponds this fall. All the hatchery ponds are now stocked and will be in full production beginning January, 1962.

Beechwood Fish Hatchery produced 77,000 bass in 1960 with all the ponds except one eight acre pond out of production. Eight hundred thirty-two thousand bluegill were produced in 1961 at Beechwood and 192,950 bass were produced in the spring of 1961.

Fish production at Lacombe was severely reduced due to a fish kill in 1960 and an overflow of the ponds during the spring of 1961. A weed problem, which is now under control, greatly inhibited harvesting procedures. Eighteen thousand four hundred bass were produced in 1960 and 55,950 were produced in 1961.

There is an experimental pond of Tilapia (mossambica) at Lacombe which has over-wintered there for the past two winters. The Tilapia were placed there for experimental purposes to control weeds. In this particular instance where they over-wintered and became overcrowded they have been of some benefit; however, they would not be of any practical use as far as being a tool where weed management is concerned. Some Tilapia were placed in ponds at Beechwood and Monroe Hatcheries. They did not overwinter at either hatchery as there was 100% mortality.

The Tilapia pond at Lacombe was opened to the public during the fall of 1961 and the fishing success was very good. Most of the catches were made on crickets and crayfish tails.

Approximately 179 areas were stocked throughout the state during the previous biennium. These included both public and private ponds and lakes.

The harvesting operations are carried out twice yearly. The brood bluegill are carefully sexed, paired off and placed in ponds in June. After the bluegill have spawned, the fry are reared to a suitable size and harvested in December or January. The harvesting operation is carried out by drawing the ponds down into the harvesting basins and removing the fingerlings with a seine.

Immediately following the harvesting of the bluegill fingerlings, the ponds are refilled. Bass brood stock are sexed, paired off and placed in ponds to spawn. This is done in February. After the bass have spawned, the brood fish are then removed to prevent them from feeding upon the fry bass. The bass fingerlings are harvested in May and the cycle is begun all over again with the bluegill brood stock.

The fish stocked in each area are harvested at the hatcheries and placed in the holding pools. The fingerlings or fry are then carefully graded, weighed and placed in oxygen supplied fish transport tanks and hauled to their destination by Louisiana Wild Life and Fisheries Commission trucks.

THE FARM POND PROJECT

SAMMY STOKES

Biologist

The farm pond program has grown considerably in size and interest since its initiation in 1955.

Pond owners' problems are varied greatly but by far the main problem in all our surveys in Louisiana is an overpopulation of bluegill.

Nothing has been done in the way of research to remedy this situation as yet but we are planning to initiate a project in the near future to this effect.

Pond sites are being selected throughout the state to be stocked with different ratios of bluegill and bass. The ponds will be seined at the end of three years and checked for balanced or unbalanced population. Ponds that contain a balanced population will be checked every year thereafter until a bluegill-bass ratio is found that will furnish the most successful fishing results for the longest period of time. Ponds that are unbalanced will probably be reclaimed and stocked with a different bass-bluegill ratio and carried on as before. Eight sites have been selected at present but I hope to have at least thirty by the fall of 1962.

Louis Bright moving fish in new holding shed at Monroe Fish Hatchery.

Fishery worker is seen checking fish in newly constructed holding pond at Lacombe Hatchery, where fish are placed until ready for delivery.

Applying rotenone to a farm pond to determine the fish population present.

A pond that is rotenoned every three or four years wastes a large number of game fish because it is almost impossible to harvest any appreciable amount of them at the time of the operation. If the fishing success could be extended over a period of three or four more extra years before it is reclaimed with rotenone or drained, it would greatly aid in helping the pond owner to have constant fishing success. Each time a pond is reclaimed it cannot be fished for two years from the time the bass are stocked; thus if you reclaimed it every 3 or 4 years, you could only fish four years out of every 6½ years. On the other hand if you reclaimed a pond every 7 or 8 years, you could have possible 8 years of successful fishing out of every 10½ years.

Mr. Max W. Summers is in the process of compiling a booklet strictly for managing farm ponds in Louisiana. This will be without a doubt one of the greatest aids to the farm pond owner since the project was originated. The book will be available to the public when it is published.

Approximately 182 farm ponds were checked during the previous biennium. Their analysis was as follows:

10%	new ponds
35%	balanced
30%	overcrowded with bluegill
10%	unbalanced due to wild fishes (shad, green sunfish, bullheads, etc.)
15%	miscellaneous (weed problems, livestock, muddy ponds, etc.)

Although pond owners in Louisiana have many management problems to overcome, the future should hold a brighter picture for them. Each pond owner who is interested in proper management of his farm fish pond should have much less difficulty if he properly utilizes Mr. Summers' management booklet when it is made available to the public. The bluegill-bass ratio project, upon its completion should also be of some significance in furnishing the pond owner continuous fishing success.

BIOASSAY PROJECT

JANICE S. HUGHES

Project Leader

Louisiana and many of its neighboring states in southeastern United States are faced with an increasing weed problem in many bodies of water. Fishing success and good fish management are dependent upon control of these weeds. Failure to control encroaching weeds will eventually spell the doom of any body of water.

New herbicides and reformulated old herbicides must become at least part of this control program. Before these chemicals can be used in the field, it is essential to know whether they are toxic to fish. This project is to determine the toxicity to fish of those herbicides which show promise in aquatic weed control. This information aids in setting up weed control programs that do little or no damage to fish populations and still open up areas for fishing.

Herbicides are tested by the Noxious Weed Control Project. Those herbicides which show a high degree of herbicidal activity are sent to the bioassay laboratory for testing.

In the past, standard glass aquaria (20 x 12 x 10 in.) were used as test vessels. These were found to be undesirable due to the difficulty encountered in decontamination after the use of certain chemicals. They were also subject to breakage, and their size and shape make them space consuming. These aquaria were replaced with plastic lined corrugated cardboard cartons which were manufactured commercially for milk transport. These cartons were later replaced with a more permanent type framework constructed from plywood and fiberglass screen. This allowed fish to be constantly viewed as chemicals were applied.

Since heterogeneity in water quality was expected to influence the reaction of at least some of the chemicals, only water from Bayou DeSiard was used. This body of water which is used by the city of Monroe as its municipal water supply is subject to little change in chemical content. The main tributary to this lake-type bayou enters below the intake pipe for the laboratory. Nonetheless complete water analysis is determined during each bioassay series.

Water in the aquariums is aerated by pressure fed perforated polyethylene tubing. Water temperature is held at 25° C. ± 1° in the constant temperature laboratory. This is necessary to remove the possible effects of low oxygen in the

View of bioassay aquariums; note bluegill sunfish in each.

A direct reading colorimeter is used as an aid in water analysis by James I. Davis.

Identification of Benthos using floating machine.

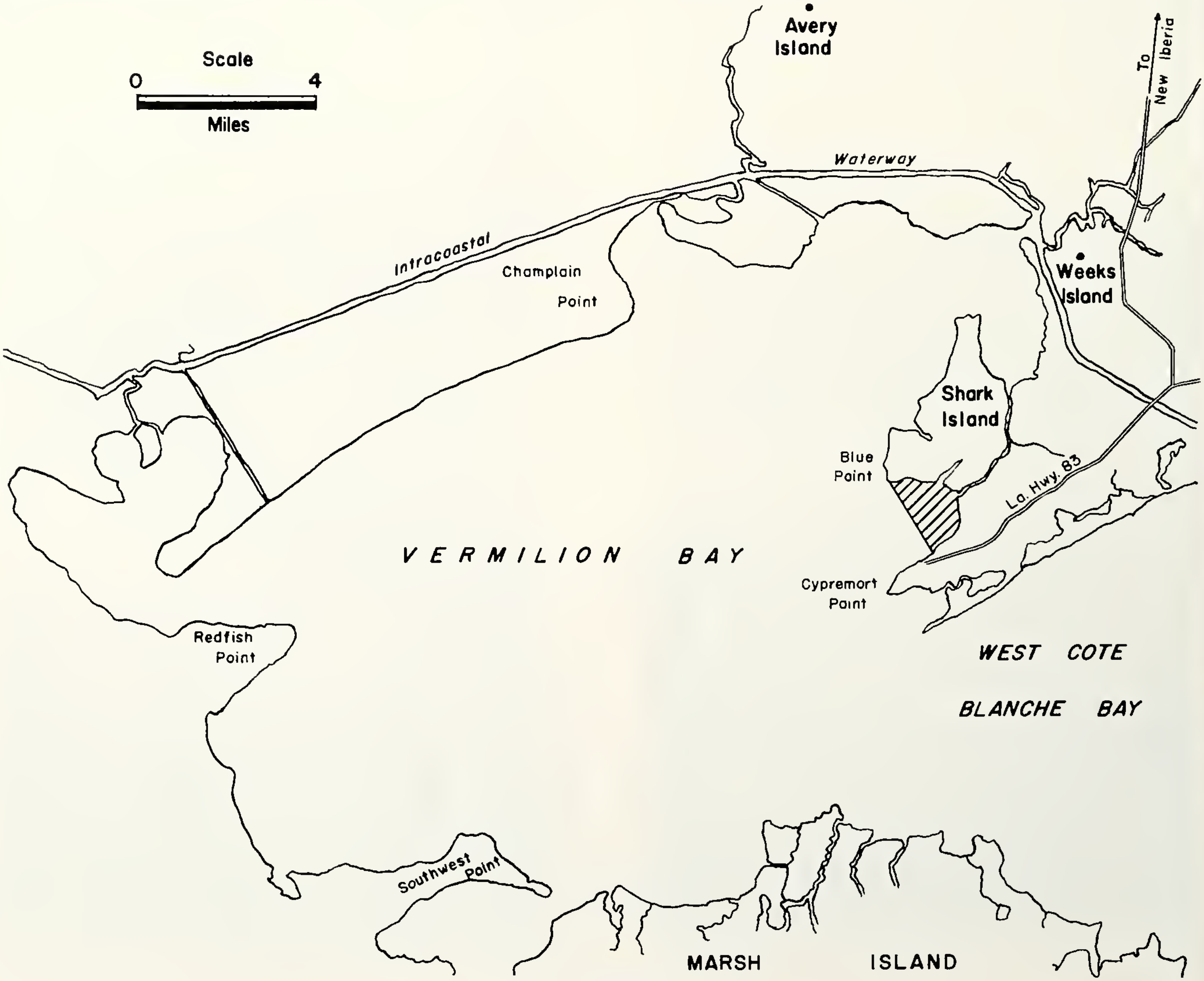
water or severe temperature fluctuations.

Bluegill sunfish are used as test organisms. These have been found to be medial in tolerance when used as assay animals and are reasonably easy to handle. Bluegill were also chosen for the tests because of availability. They are raised at the Monroe Fish Hatchery where the laboratory is located.

All fish used in the bioassays are fingerling size (3-5 inches). For each bioassay the fish used are all of one size. The bluegill are placed in each aquarium and allowed 24 hours to recover from the shock of handling. After the fish have become acclimated, appropriate amounts of the test chemical are added to the 25 liters of water in the aquarium to give the desired concentration.

After the chemicals are added, fish are observed for one hour to determine if the fish attempt to avoid the concentrated chemical. Six hours later this determination is again made.

For each chemical, trial concentration series are established using one aquarium and ten fish for each concentration. Verifying series consisting of five replicate aquaria, each with ten fish, are subsequently used to validate the TLm obtained from the trial series. A TLm (median tolerance limit) is that concentration at which 50 per cent of the fish are able to survive. TLm



Map of Vermilion Bay

in each case is determined by graphic interpolation.

Some of the more common chemicals tested and the results obtained are as follows:

Chemical	*24 Hours*	*48 Hours*
2, 4-D	390	375
CIPC	20	12
EDB	20	8
Nemagon	25	18
2, 3, 5-T BA	175	90
Endothal	450	300
Diquat	525	150

Several new emulsified rotenone materials were investigated. This was done in an effort to determine the feasibility of their use under the varying conditions found in Louisiana. At this time, several of these formulations are being made commercially available.

This study will continue as long as new herbicides and insecticides that can be used in Louisiana continue to appear on the market. In this way, we are assured that any material which is applied to Louisiana waters will not damage the sportsman's paradise of which we are so proud.

CYPREMORT POINT, IBERIA PARISH

LLOYD POSEY
Project Leader

This study was initiated in July of 1959 for the purpose of evaluating the area's utilization by marine game fish for spawning, with special emphasis on speckled trout and redfish. The study area is located in east Vermilion Bay, northeast of Cypremort Point. (see map). Monthly sampling includes water chemistry for pH, free CO_2, alkalinity, chloride, salinity, and temperatures; plankton samples; and trawl and trammel net samples for fish (see photos).

A four pound redfish collected by trammel net at Cypremort Point.

Speckled trout and redfish taken in trammel net at Cypremort Point.

Evaluation of data collected through November of 1961 reveals a more intensified study needs to be conducted in the Cypremort Point area. Due to limited fisheries personnel, collection of data in the area has been insufficient to support an evaluation of the use of the cove by spawning sport fish. With the hiring of a new fisheries biologist in September of 1961 and assigning him to District VI, a more intensified study is planned for this study area during the next biennium.

LAKE MANAGEMENT PROJECT

LLOYD POSEY
Project Leader

This project is diversified in nature. It has two primary areas of responsibility, fishery research and management. Project personnel work closely with sportsmen, civic groups, and governing bodies in investigating local fisheries' problems and providing recommendations for improvement. The lake management project conducts research studies of a short and long range nature and carries out management practices on many of our lakes.

Each lake in our state has its individual characteristics, no two are exactly alike. An investigation into the ecology of a lake is a prerequisite to its management. Facts and techniques determined from our research studies and those of other fishery workers are utilized in our efforts to wisely manage our freshwater fisheries resources.

FISH POPULATION STUDIES

One of the more important phases of our research program is our annual fish population sampling and investigation of the major lakes throughout the state. By keeping a yearly check on populations we can detect any changes and have background data readily available should it be necessary to take corrective measures. Population samples are taken using rotenone, seines, nets, traps and electricity. Louisiana is covered with numerous lakes, streams, and bayous and it is impossible to take population samples in each one annually. Some of our more important lakes from the standpoint of fishing pressure are sampled each year. Other lakes are sampled periodically or by request.

The productivity of a lake is related to the fertility of its watershed. Man-made lakes located in a relatively infertile watershed can not be expected to produce as many fish as lakes located in the fertile area adjacent to the Mississippi River in Northeast Louisiana. The waters supporting the greatest fish populations are backwater areas such as the Spring Bayou complex in Avoyelles Parish. Here the fluctuating water levels combine with fertile soil to produce fish in abundance.

Table No. I

SLAT TRAP STUDY

The lake management project is constantly experimenting with new gear or techniques that might prove useful in fisheries management. One item currently under study is the slat or basket trap. While slat traps are not new fishing devices they do promise to be useful in harvesting catfish without damaging game fish populations. Slat traps are fish entrapment devices usually constructed of thin wooden slats or similar materials. The trap may be square or round, and has a funnel shaped opening or flue at one end through which fish enter. The flue usually is flexible and quite narrow at its apex. Catfish push through this narrow opening to get to the bait and are unable to get out.

Previous research had indicated that these slat traps were very selective, catching catfish almost exclusively. Since the harvest of commercial fish is necessary to promote balanced fish populations any device that may be used to that end without depleting commercial fish brood stock or destroying game fish should be put to use. While the previous research regarding slat traps was conclusive regarding the traps' selectivity, it was felt that further study of trap designs and fishing methods was needed. Project personnel constructed a number of slat traps in order that they might be tested more thoroughly. Traps were made of thin oak strips, masonite, and other materials. Each trap differs in some detail of design or construction. Some have no spaces between the slats and resemble hollow logs, others have openings between the slats ranging from one-half to two and one-half inches. Flues were constructed of wire, webbing and flexible wooden strips. We have 35 different trap designs that are being tested in lakes and streams throughout the state.

Slat traps are usually fished with bait. For this reason we are experimenting with various baits to determine if one is more effective than others. An analysis of bait used thus far is presented herein. Other baits are to be tried in the future and some of the baits listed will be tested further to equalize the fishing effort.

Table No. II

This study was initiated in the spring of 1961 and is scheduled for completion in the next biennium. Data gathered thus far is reported herein. Slat or basket traps do not catch large numbers of fish per unit of effort. Thus far catch in project traps has been .078 fish per trap fished for a 24 hour period. They are very selective, capturing catfish almost exclusively.

ANACOCO LAKE—VERNON PARISH

In 1960 the Anacoco Prairie Game and Fish Commission requested assistance in managing Anacoco Lake for sport fishing and combating an aquatic vegetation problem. Project personnel conducted a biological survey on the lake with the assistance of the Aquatic Vegetation Control Section. Population samples were taken using a series of one-acre rotenone samples. After obtaining cross-section profiles of the lake bed, a management plan was prepared and presented to the Anacoco Prairie Game and Fish Commission. This plan called for the annual lowering of the water level (fluctuation) in order to promote a more balanced fish population and help retard the spread of aquatic vegetation. The local commission adopted the management plan in 1961. The gates were opened in July and the level dropped approximately six feet. The gates were closed in October, 1961, and the level returned to normal. Fishing success was very good during the draw-down period. Rotenone population samples are planned for the next two or three years to determine the effect of fluctuation on total production and species composition in this lake.

BARKSDALE AIR FORCE BASE

The Louisiana Wild Life and Fisheries Commission is co-operating closely with air force personnel in managing the game and fish resources on the base reservation. Barksdale Air Base is fortunate in having an excellent conservation staff whose accomplishments in the field of fish and wild life management resulted in their being presented the Gen. Thomas White award for the most outstanding conservation program in the Strategic Air Command for 1961.

In 1959 the entire fish populations in three lakes were killed out and the lakes were restocked in 1960. The lakes were opened for fishing in May, 1961 with excellent results. All rehabilitation and management practices are carried out by base personnel with technical assistance furnished by this and other projects.

Table No. II

ANALYSIS OF BAITS USED IN SLAT-TRAP STUDY

Type of Bait	*Cottonseed Cake*			*Lazy Ike*			*Canned Dog Food*			*Cheese*			*Combination Lazy Ike and Cottonseed Cake*			*No Bait*			*Bone Meal*		
	337 Trap Days			*96 Trap Days*			*37 Trap Days*			*18 Trap Days*			*20 Trap Days*			*5 Trap Days*			*114 Trap Days*		
Species Captured	*No.*	*Av. Lgth.*	*Wt.*	*No.*	*Av. Lgth.*	*Wt.*	*No.*	*Av. Lgth.*	*Wt.*	*No.*	*Av. Lgth.*	*Wt.*	*No.*	*Av. Lgth.*	*Wt.*	*No.*	*Av. Lgth.*	*Wt.*	*No.*	*Av. Lgth.*	*Wt.*
Channel Catfish	13	14.00	21.1	3	12.67	1.9	..	....	...	..	....	...	3	14.17	3.2	..	....	...	10	14.90	12.3
Blue Catfish	..	....	...	8	13.81	8.9	..	....	...	..	....	...	..	....	...	..	....	...	..	....	...
Flathead Catfish	5	21.80	40.0	..	....	...	..	....	...	1	16.00	2.8	..	....	...	..	....	...	..	....	...
Black Bullhead	2	14.00	4.0	..	....	...	1	13.00	1.0	..	....	...	..	....	...	..	....	...	..	....	...
Yellow Bullhead	..	....	...	..	....	...	..	....	...	..	....	...	..	....	...	..	....	...	1	14.00	1.4
Brown Bullhead	..	....	...	..	....	...	1	13.00	0.9	..	....	...	..	....	...	..	....	...	1	13.50	1.4
TOTALS	20	....	65.1	11	....	10.8	2	....	1.9	1	....	2.8	3	....	3.2	..	....	...	12	....	15.1
Number Captured per Trap-Day by Type of Bait		.059			.115			.054			.056			.150			...			.105	

TABLE I

COMPARISON OF FISH POPULATIONS FOUND IN THREE DIFFERENT TYPES OF LAKES

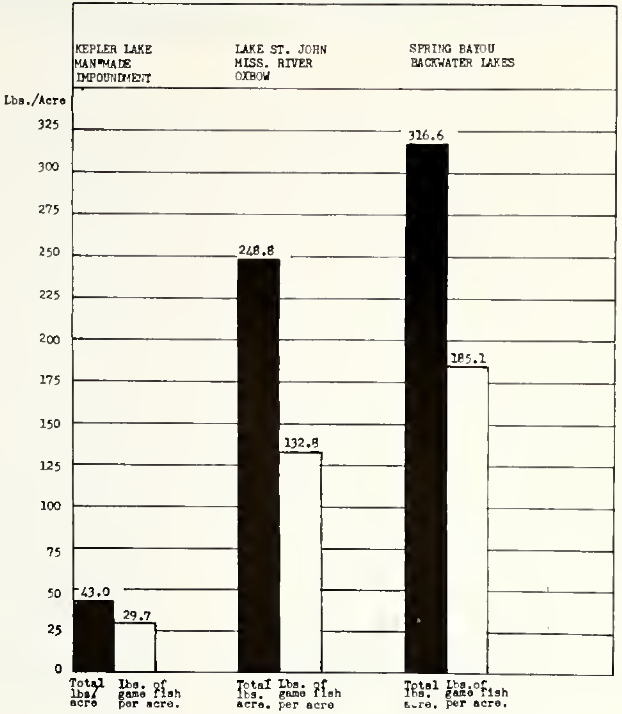


Table No. III

RESULTS OF SLAT TRAP FISHING WITH PROJECT TRAPS TOTAL TRAP-DAYS* FISHED 627

Species	*Total Number*	*Average Length*	*Total Weight in lbs.*	*Average Weight in lbs.*
Channel Catfish	29	14.19	38.5	1.33
Blue Catfish	8	13.81	8.9	1.11
Yellow or Flathead Catfish	6	20.83	42.8	7.13
Yellow Bullhead	1	14.00	1.4	1.40
Black Bullhead	3	13.67	5.0	1.67
Brown Bullhead	2	13.25	2.3	1.15
Totals	49		98.9	

Number of fish captured per trap-day=.078
Pounds of fish captured per trap-day=.157

---

*Trap-day = One slat trap fished for a period of 24 hours.

BAYOU PIERRE CUT-OFF, CADDO PARISH

In October, 1960, a 40 acre section of Bayou Pierre Cut-Off was totally poisoned with rotenone. The bayou winds through the Broadmoor section of Shreveport and is a convenient source of recreation for residents of that area. The fish population was out of balance, gar and other rough fish predominating. The reclamation project was sponsored by a Shreveport Chapter of the Veterans of Foreign Wars. This organization furnished the rotenone for the project and Lake Management personnel conducted the poisoning operation. The bayou was restocked with bluegills, largemouth bass, and black crappie.

BLACK BAYOU LAKE—CADDO PARISH

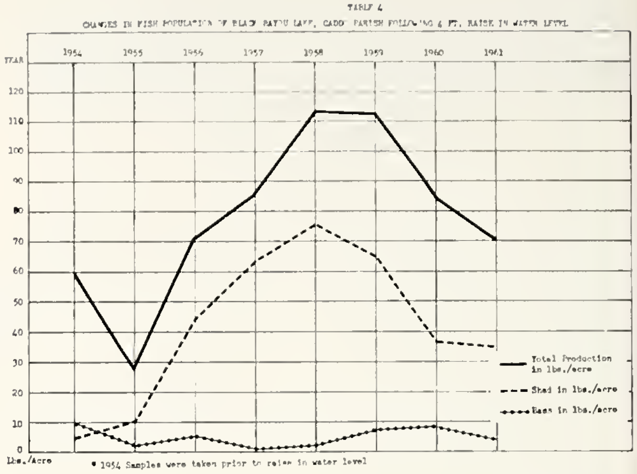
This is a man-made lake, with an area of 3,960 acres. In 1954 the water level was raised four feet. This study is conducted for the purpose of evaluating the effects of the increased water level on the fish population. Population samples were collected prior to the level raising and have been collected annually since that time. Five one-acre sampling sites were chosen and standard rotenone samples are taken at these five locations annually. The data thus obtained has reflected several changes in the population. Shortly after the rise gizzard shad increased rapidly and a corresponding decrease in largemouth bass was noted. Later the shad population declined somewhat, then, more or less leveled off with some annual variation. Bass increased somewhat after the drastic decline but have failed to reach their abundance prior to the raised water level.

In addition to population sampling an annual check was conducted on the extent of the aquatic vegetation. This is to determine what changes have occurred since 1954. An attempt to control profuse aquatic vegetation was the primary reason for raising the lake's level. In the summer of 1961 vegetation had increased to the point that the upper portion of Black Bayou Lake was almost impassable. This project will be terminated during the next biennium and a completion report will be written.

Table No. IV

CADDO LAKE

The purpose of this study was to evaluate changes in the fish population, total production, and species composition in Caddo Lake. This large shallow impoundment lying in Louisiana and Texas has been one of the lowest fish producers in pounds per acre according to our rotenone samples. Six sampling stations were chosen in 1954 and rotenone samples were taken annually at these sites. With the completion of the 1960 samples the field work on this project was terminated and final analysis of data is underway.



CANE RIVER LAKE, NATCHITOCHES PARISH

Cane River is a 36 mile long old river channel that meanders through Natchitoches Parish. It was totally poisoned in 1955 and subsequently restocked. Fish population samples using rotenone, seines, hoop nets and trammel nets have been taken annually since restocking. Gizzard shad soon became overabundant and a 3 year selective poisoning project was undertaken to control them. Cane River was selectively poisoned in 1958, 1959 and 1960. Population samples will be taken for at least two more years in order to evaluate the results of the selective poisoning project.

In order to more fully determine the extent of carp and bullhead populations demonstrated in rotenone samples, extensive fishing has been conducted during the past biennium with seines, hoop nets, trammel nets, and more recently slat traps.

LAKE MARTIN, ST. MARTIN PARISH

Lake Martin is a shallow impoundment located a few miles east of Lafayette. Its design is unusual in that a ring levee completely surrounds the lake. The water source is the Ruth Canal which is adjacent to the north end of the lake. Water is pumped from the canal into Lake Martin. Large areas are heavily wooded. This condition plus profuse growths of aquatic vegetation renders much of the lake unusable for sport fishing.

The Lake Martin Game and Fish Commission requested that a biological survey of the lake be conducted and any recommendations for improvement be forwarded to them. The survey included fish population samples and determination of physical characteristics.

It was recommended that Lake Martin be opened to commercial fishing. The population samples reflected a high percentage of commercial fish which are competing with game fish for food and space. Other recommendations included annual water level fluctuation to promote balanced fish populations and aid in aquatic vegetation control, timber removal or thinning, and deepening certain areas to provide adequate depth during draw-down.

LAKE ST. JOHN, CONCORDIA PARISH

The 1961 rotenone samples gave evidence of a high percentage of forage fish, primarily gizzard shad, present in Lake St. John. These data coupled with reports of declining fishing success indicated the necessity of corrective measures. It was decided that a selective poisoning operation to remove gizzard shad would be executed. The Concordia Parish Police Jury purchased the necessary rotenone, approximately 935 gals. On October 12, 1961 fisheries section personnel applied the rotenone using a concentration of one-tenth parts of rotenone per million parts of water. The entire lake was treated in a period of six hours. Large numbers of shad were killed and mortality among other fish was low.

A creel census was initiated during the summer of 1961 in order to determine fishing success prior to selective poisoning. This census will continue into next year so that the effect of selective poisoning on actual fishing success may be properly evaluated. Rotenone population samples will furnish data relative to the changes in species composition and total production.

Rotenone sample in Lake St. John.

Raising basket trap in Lake St. John.

SIBLEY LAKE, NATCHITOCHES PARISH

Under construction at present, this lake's primary purpose is to insure an adequate water supply for the city of Natchitoches and Northwestern Louisiana State College. Before construction was initiated project personnel were asked to prepare a management plan for Sibley Lake. This is the most opportune time for preparing a management plan since certain design features that could not be made after impoundment can easily be incorporated in the plans at little additional cost. Also regulations and management practices are more readily accepted when carried out from the time of impoundment. Further, it is easier to maintain good fishing when proper management practices have been carried out from the lake's beginning.

Sibley Lake is being cleared of brush and timber. This will be of great value in that small forage fish can be more easily controlled in a clean body of water. Vast amounts of trees, brush and debris furnish innumerable hiding places for small forage fish. The large carnivorous species can not adequately prey on and reduce the number of forage fish in such places. As a result forage fish rapidly become overabundant, exceeding their food supply, and stunting results.

SPANISH LAKE, IBERIA PARISH

Spanish Lake is a natural shallow lake around which a ring levee has been constructed in order to hold a higher water level. It has an area of 1,240 surface acres at 13.0 ft. M. S. L.. Water is pumped from the Daigre Canal into Spanish Lake to maintain the water level. Approximately one-third of the lake is timbered and large areas are infested with water hyacinths and alligator weeds.

Population samples taken in May, 1961, indicated a very low population composed chiefly of bowfin and other rough fish.

Recommendations for management were prepared and presented to the Spanish Lake Game and Fish Commission. It was suggested that the lake be drained and as much timber removed as possible. Any fish remaining in potholes should be poisoned with rotenone. After reflooding and restocking an annual water level fluctuation was recommended.

FISH POPULATION SAMPLING

In addition to the previously mentioned projects fish population samples were taken in the places listed below during this biennium. Sampling was accomplished by use of nets or rotenone and in some cases both methods were used. Some of the bodies of water listed below were sampled twice during this period.

Body of Water	*Parish*	*Type of Samples*
Algiers Park	Jefferson	Rotenone
Bay Wallace	Terrebonne	Netting
Big Creek	Grant	Netting
Big Lake	Franklin & Tensas	Netting
Lake Borgne	St. Bernard	Netting
Catahoula Lake	Rapides & LaSalle	Rotenone
Cocodrie Lake	Rapides	Rotenone
Lake Concordia	Concordia	Rotenone
Corney	Claiborne	Rotenone
Davis Lake	Caldwell	Rotenone
Lac Des Allemands	St. John the Baptist	Rotenone
Bayou DeSiard	Ouachita	Rotenone
Eagle Lake	Madison	Rotenone
Lake Fields	Lafourche	Netting
Lake Fausse Point	Iberia	Rotenone
Iatt Lake	Grant	Rotenone
Indian Lake	Madison	Rotenone
Kepler Lake	Bienville	Rotenone
Lafourche Lake	Caldwell & Franklin	Rotenone
Lake Louie	Catahoula	Rotenone
LaNana Bayou	DeSoto & Sabine	Rotenone
Lake Long	Lafourche	Netting
Loring Lake	DeSoto	Rotenone
Murray Lake	Webster	Rotenone
Negreet Bayou	DeSoto & Sabine	Rotenone
Lake One	Madison	Rotenone
Lake Providence	East Carroll	Rotenone
San Miguel Bayou	DeSoto & Sabine	Rotenone
San Patricio Bayou	DeSoto & Sabine	Rotenone
Spring Bayou	Avoyelles	Rotenone

The mounted scales or impressions are placed in a scale reading machine and their enlarged image is projected on a viewing screen at the front of the machine. Mrs. Joann Williams, Biological Aide, examines the projected image of a redear sunfish scale.

Rotenone sample in San Miguel, Sabine Parish.

DINGELL-JOHNSON PROJECT F-1-R FISH POPULATION INVESTIGATION

VICTOR M. LAMBOU
Project Leader

JOANN WILLIAMS
Biologist Aide

On April 1, 1953, Dingell-Johnson Project F-1-R (Fish Population Investigation) was initiated in order to gather basic information needed to plan a constructive sport fish management program. The Fifth, Sixth, Seventh and Eighth Biennial Reports covered the progress of the project through December 31, 1959. On June 30, 1961 the project was terminated. All progress reports have been prepared and forwarded to proper authority and all work on the project has been terminated with the exception of the publication of some of the project findings, which will appear as state bulletins and/or in technical journals.

The following progress reports have been submitted during the biennium:

(1) Physical Characteristics of Clear Lake, Richland Parish, Louisiana.

(2) Successful Bass, Crappie and Sunfish Fishing Parties and Parties Making Limit Catches on Clear Lake September, 1958 through August, 1959.

(3) Distribution of Fishes in Lake Bistineau, Louisiana.

(4) Utilization of Macrocrustaceans for Food by Fresh Water Fishes in Louisiana and Its Effect on the Determination of Predator-Prey Relationships.

(5) Clear Lake Creel Census, Materials and

Methods, September, 1958 through August, 1959, Supplement No. 1.

(6) Clear Lake Creel Census, September, 1958 through August, 1959.

(7) Relationship of Catch Per Unit of Effort to the Time Spent Sport Fishing.

(8) Louisiana Wild Life and Fisheries Commission, Dingell-Johnson Project F-1-R, Progress Reports, April, 1953-June, 1960.

(9) Physical Characteristics of Clear Lake, Richland Parish, Louisiana—Supplement No. 1.

(10) Louisiana Wild Life and Fisheries Commission, Dingell-Johnson Project F-1-R, Publications, Papers and Miscellaneous Reports authored by Victor W. Lambou, Project Leader.

(11) Fishes Occurring in Lake Bistineau, Louisiana.

(12) Time Interval Method of Determining Fishing Pressure.

(13) Comparison of Catch of Sport Fish by Boat and Shore Fishermen on Clear Lake, Richland Parish, Louisiana.

(14) Comparison of Catch of Sport Fish by Boat and Shore Fishermen on Clear Lake, Richland Parish, Louisiana, Supplement No. 1.

For the larger fish, plastic impressions of the scales are usually made with a Rolling Mill. Plastic impressions are more translucent than the original scales, and thus the annuli or growth rings can be seen much more readily. These growth rings are ofter impossible to see on the opaque scales themselves, but can readily be seen on the impressions. Victor Lambou, Project Leader, prepares plastic impressions.

The scale samples are cleaned and then prepared for examinations by one of two methods. Pat McCoy mounts scales between glass slides.

(15) Preliminary Draft, Misuse of Analyses of Covariance with Creel Census Data.

(16) Comparison of Catch of Sport Fish by Fishing Parties of Different Races on Clear Lake, Richland Parish, Louisiana, September, 1958 through August, 1959.

(17) Comparison of Catch of Sport Fish by Licensed and Non-Licensed Fishermen on Clear Lake, Richland Parish, Louisiana.

(18) Comparison of Catch of Sport Fish by Licensed and Non-Licensed Fishermen on Clear Lake, Richland Parish, Louisiana, Supplement No. 1.

(19) Catalogue of Dingell-Johnson Project F-1-R data.

(20) Comparison of Catch of Sport Fish by Fishing Parties of Different Sexes on Clear Lake, Richland Parish, Louisiana.

(21) Comparison of Catch of Sport Fish by Fishing Parties of Different Sexes on Clear Lake, Richland Parish, Louisiana, Supplement No. 1.

(22) Distribution of Fishes in Lake Bistineau, Louisiana, Supplement No. 1.

(23) Comparison of Catch of Sport Fish by Fishing Parties of Different Sexes on Clear Lake, Richland Parish, Louisiana, September, 1958 through August, 1959.

(24) Comparison of Catch of Sport Fish by Licensed and Non-Licensed Fishermen on Clear

Lake, Richland Parish, Louisiana, September, 1958 through August, 1959.

(25) Comparison of Catch of Sport Fish by Boat and Shore Fishermen on Clear Lake, Richland Parish, Louisiana, September, 1958 through August, 1959.

Various technical papers were presented at technical fishery meetings and/or published in technical journals. These papers are as follows:

(1) Utilization of Macrocrustaceans for food by fresh-water fishes in Louisiana and its effects on the determination of predator-prey relationships. The Prog. Fish-Culturist, 23(1): 18-25 (1961).

(2) Fish Populations of Mississippi River Oxbow Lakes in Louisiana. The Proc. of the Louisiand Academy of Sciences, 23: 52-64 (1960).

(3) Fish Populations of Alluvial Flood Plain Lakes in Louisiana. The Proc. of the Louisiana Academy of Sciences, 24, In Press (co-authored by the project leader and Donald W. Geagan, Louisiana Wild Life and Fisheries Commission).

(4) Efficiency and Selectivity of Flag Gill Nets Fished in Lake Bistineau, Louisiana. Presented at the Fifteenth Annual Conference of the Southeastern Association of Game and Fish Commissioners, October, 1961, Atlanta, Georgia.

(5) Determination of Fishing Pressure from Fishermen or Party Counts with a Discussion of Sampling Problems. Presented at the Fifteenth Annual Conference of the Southeastern Association of Game and Fish Commissioners, October, 1961, Atlanta, Georgia.

(6) Estimating the Number of Marked Animals Which have Retained Their Identity from Multiple Marked Animals and its Application to the Petersen Method. Presented at the Fifteenth Annual Conference of the Southeastern Association of Game and Fish Commissioners, October, 1961, Atlanta, Georgia. (co-authored by the project leader and Robert J. Muncy, School of Forestry, Louisiana State University, Baton Rouge, Louisiana).

Fish, from which scale samples are taken, are collected in various ways, usually in conjunction with fish population sampling operations, such as the samples being taken by rotenone poisoning from a bayou off West Pearl River.

Other technical papers have been submitted to various technical journals for publication and will appear in these publications during the next biennium. Several publications of a semi-technical nature are in the process of being prepared or have been prepared and will be published as state bulletins.

Culicidae larvae found in many benthos samples, as seen through a microscope.

DINGELL-JOHNSON PROJECT F-6-R

"An Ecological Survey of Factors Affecting Fish Production in Louisiana Waters"

DONALD W. GEAGAN
Project Leader

THOMAS D. ALLEN, JR.
Assistant Project Leader

This project terminated June 30, 1960; a final report has been prepared and distributed. The study conducted in four Louisiana lakes covered a three year period. These lakes were Cane River Lake, Natchitoches Parish; Caddo Lake, Caddo Parish; Lake Providence, East Carroll Parish; and Chicot Lake, Evangeline Parish.

The purpose of this project was to determine the normal biological, chemical, and physical conditions which are related to fish production in representative lakes in Louisiana. It included an evaluation of plankton, benthos, and fish population standing crop production plus fish stomach analysis. Pertinent chemical and physical characteristics were also reported.

DINGELL-JOHNSON PROJECT F-7-R LAKE D'ARBONNE AND BUSSEY LAKE INVESTIGATIONS

JAMES T. DAVIS
Project Leader

JANICE S. HUGHES
Assistant Project Leader

Successful management of reservoirs and lakes depend on accurate records of fish production. This project deals with two lakes, one large and one medium sized, in Northeast Louisiana. Objectives of the study include, evaluation of certain management procedures, effects of standing trees on the population and harvest of fish, economic impact both local and area wide of an impoundment and the potential fish harvest of a new lake in Louisiana.

Bussey Brake Reservoir is a 2200 acre impoundment lying 7 miles northwest of Bastrop in Morehouse Parish. International Paper Company constructed the lake to furnish an adequate fresh water supply for 2 paper mills located in Bastrop. The company's interest in the development of recreational uses of the lake led to a cooperative fish management program with the Louisiana Wild Life and Fisheries Commission.

The lake is generally circular with a regular shoreline of approximately 7.8 miles. Wide bands of trees were left standing in the lake to reduce wave action. The lake's depth at pool stage varies from 4 feet to 40 feet with an average depth of 11 feet. Initial filling of the lake started immediately after the completion of the levee in late 1958. Water depth was sufficient for the lake to be stocked beginning in January 1959.

Fish were stocked by the Louisiana Wild Life and Fisheries Commission. Stocking was limited to largemouth bass, bluegill, black crappie and channel catfish.

After it had been determined that the fish population was adequate to support the expected fishing pressure, the lake was opened to public fishing on April 30, 1960. It was recognized that the sod on the levee was inadequate at this time. The exuberance and numbers of fishermen using the lake during the first 5 days and the resultant operation of outboard motors at high speeds caused washing of the levee in many places. For this reason the use of outboard motors on the lake was forbidden after May 4, 1960. Further study of the problem resulted in the decision to permit the use of electric trolling motors. This became effective May 16, 1960. This restriction remained in effect until July, 1961 when gasoline motors of 3 horsepower or less were admitted to the lake. The only restriction placed on the operation of these motors is that they are not to be operated within 100 yards of the bank.

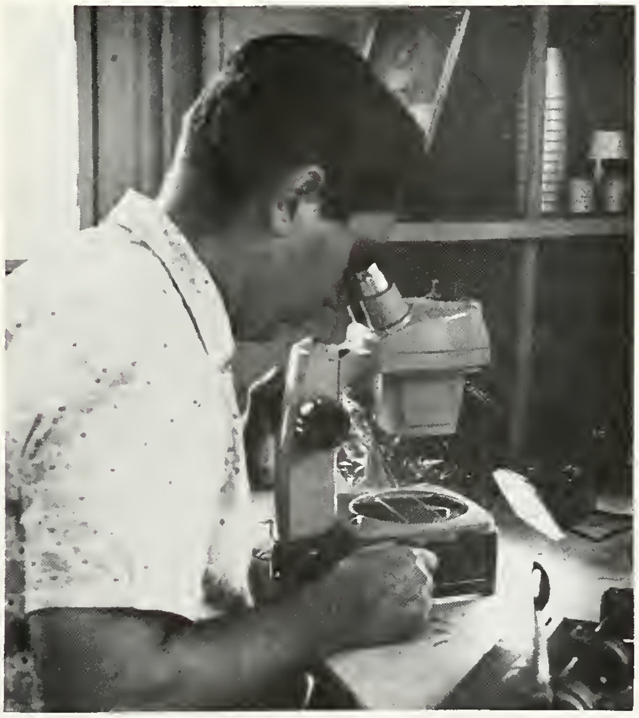
In order to determine the harvest of this lake a creel census was initiated. Seven census days per month are chosen at random with each day of the week equally represented. This allows censusing of approximately 25 per cent of the days.

On creel census days three creel clerks arrive at the lake at daylight. Any cars already present are noted and the number of fishermen in each recorded as they return from the lake. All fishermen entering the lake after daybreak and before night fall are recorded. As these fishermen leave the lake their creels are checked by the clerks. This two-way check is available for most fishermen on census days. The exception being those that enter before daybreak and return after dark.

Entrances to the lake are so situated that three census clerks can observe all seven entrances. With minor exceptions it is possible for them to check all fishermen leaving the lake. With the data thus obtained, the total number of fishermen hours and the catch per hour are determined.

The counts made by the boat dock operators are used as a check on fishermen usage. From the days when total checks are made, the percentage of people using their docks is determined. These counts are then expanded to determine the total number of fishermen using the lake. These data are for comparison only and are not treated as having the same accuracy as data obtained from creel clerks.

Due largely to the cooperation of the general public, International Paper Company and the



Fishery Biologist, Vic Lambou, looking at fish scales.

concessionaire, this creel census method has met with unusual success.

Creel census results indicate that approximately 55,872 people caught an estimated 426,862 fish during the first year of fishing in Bussey Lake. These fish averaged 0.53 pound for a total weight of 226,236.86 pounds. This is an average of 194.03 fish per acre which weighed 102.83 pounds. These fish were caught in 99.75 hours.

The effects of trees on the catch of fish was negligible throughout the year. More crappie were taken in the open water than in the trees. The lowest number of fish per hour was taken by those persons who fished both the trees and open water. Apparently this is recognition of the fact that they spent more time looking for where the fish were biting on that day.

It is of interest that the average weight of fish remained high for the entire year. If the average weight of fish caught can be maintained or slightly increased, fishermen will continue to exert heavy fishing pressure on the lake.

In order to determine the fish population in Bussey Lake, samples were taken with trammel nets and rotenone. Trammel nets were fished in both trees and open water areas of the lake. These nets ranged from 1-inch mesh to 4-inch mesh. The catches indicate that there is a definite difference in the composition of the population in different areas of the lake. The open water areas show the highest population of most types of fish. The exceptions were bass and crappie. The tree area shows the lowest population of bullheads, channel catfish and bowfin. Forage fish populations are lowest in the brush areas. It is apparent from this that while the population differs in composition between areas, the major difference lies not within the game fish, but within the other types.

Rotenone samples were taken in the same general areas as net samples. Each sample consisted of a one acre set. The sets were surrounded with a 1-inch mesh seine and 1 ppm of rotenone was applied inside. The fish that came to the surface the first day were picked up immediately, weighed and measured. The nets remained in place until the following day. All floating fish were then picked up and processed. The rotenone samples indicate a much higher game fish population in the tree area than in the open. The open water area supports a higher number of sunfish than the brush area. It is obvious that the selectivity of the two methods affect the validity of the data presented. Rotenone sampling is generally thought to be the least selective. If such is the case, trees definitely affect the aggregation of game fish favorably. This does not mean than the fish found in the tree areas were all spawned and reared in the trees. Instead it would seem to indicate that the trees form an attractant to the fish. As further validation of this theory, it should be noted that the numbers of intermediate and fingerling size fish vary only slightly between the areas.

Lake D'Arbonne is a partially completed impoundment of approximately 15,000 acres located in Union Parish and Lincoln Parish in Northeast Louisiana. This lake was made possible through Act No. 9 of the Louisiana Legislature of 1956.

Site of the Lake D'Arbonne dam is six air miles southeast of Farmerville. Pool stage of the lake will be 80 feet msl. Originally scheduled for completion by January, 1962, high water levels forced the projected completion time to be revamped to January, 1963. Access to the area is provided by Louisiana state highways 33, 15 and 2. The former two highways are both being raised and will transverse portions of the lake.

Many proposals have been submitted to the board of commissioners with reference to possible uses of the lake. Many of these have on closer examination been rejected as impractical or illogical. Definite plans have been made for public parks and public access areas.

Preimpoundment investigations on this area began in 1958. Water chemistries, fish population samples and fish food samples have been taken annually since this time. These samples indicate that while there is a small sport fishery on the present stream, the impoundment should increase the sport fishery potential at least a hundred fold.

Samples of fish were taken using rotenone and hoop nets. The rotenone samples were taken in September when the bayou was at low flow. One-half acre sets were blocked off by nets at the upper and lower end. Rotenone was applied upstream inside the net at the rate of one part per million. As the rotenone reached the lower net, potassium permanganate at the rate of one ppm active ingredient was added. This serves to oxidize the rotenone. Few fish were observed in distress below the net. All of the fish that came to the top of the water within the area were picked up. Complete data were taken as to length and weight of all fish captured. At the end of four hours the nets were removed.

Four rotenone samples were taken, two in the main bayou and two in the tributary streams. These areas were chosen to be representative of the fish population in the bayou.

While there is a good population of sport fish, the commercial fish and forage fish population is too high for good sport fishing in an impoundment. On the basis of these findings tentative stocking recommendations have been made. These recommendations include a generous stocking of adult largemouth bass and black crappie. In addition a heavy stocking of fingerling bluegill and channel catfish is contemplated.

In order to determine the fish harvest of the bayou a creel census was initiated. The census was designed to cover 50 miles of the study area for two thirteen week periods annually. The periods were to be separated by at least 90 days as an estimate of the catch for the whole year was desired.

It was found to be impractical to attempt a creel census at any time when the bayou was over its banks. Dense trees and brush in the lowlands made accurate counting of fishermen from a boat impossible. An airplane for counting was not immediately available and visibility would have rendered such counting erratic if not impossible. Therefore, the creel census was confined to times when the bayou was near or below bankfull stage.

The study area was divided into five 10-mile areas. The areas were divided into two groups due to distance involved. The sampling schedule was arranged to allow each group to be visited in a single day. All weekends and holidays were included in the schedule. Three week days were included each week.

The schedule for trips to each area was set up at random in two groups, weekends and week days. An equal number of visits were scheduled to each area on each day of the week during the census period. Due to various factors such as sickness, motor troubles, etc., the actual number of visits to each area was not equal when the census was completed.

Fish food and water quality studies were initiated on the bayou in 1958. These studies are conducted in an effort to determine the direct effect of these factors on fish production. These samples are taken quarterly at six stations. One of these stations is below the dam and one in the deep water immediately above the dam. Two samples are taken in the middle portion of the lake and one sample in each of the two tributaries.

These studies tend to indicate that there is an adequate fish food population present in the bayou. In addition there are adequate adults present to assure a rapid population of the lake area soon after impoundment. Studies of the water quality indicate that while there is still room for improvement the salt water load of the bayou is steadily decreasing. If continued progress is made the completed lake should not suffer from pollution.

The economic study of this lake required the development of several new techniques and procedures. During the early spring of 1961, a survey of the land and real estate values in the area was conducted by the Branch of Realty of the U. S. Fish and Wildlife at the request of the project leaders. Wholesale grocery sales in the area are being determined through the cooperation of a local wholesale grocer. The sale of line fish bait is being determined through the cooperation of three growers. The substance of this report on background investigations will be published by the commission in the near future.

DINGELL-JOHNSON PROJECT F-8-R

"An Investigation of the Sport Fishes in the Coastal Waters of Louisiana"

DONALD W. GEAGAN
Project Leader

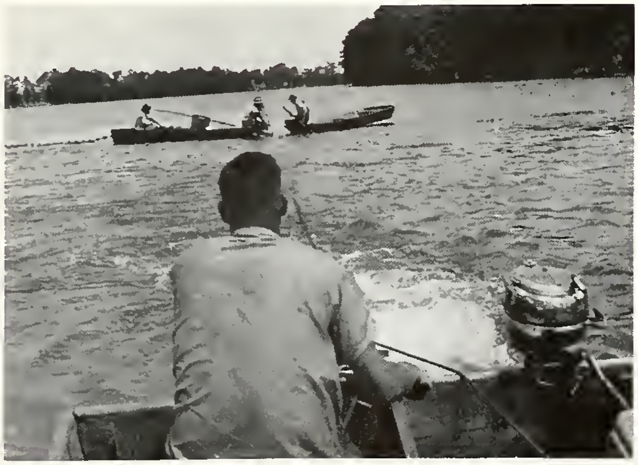
LARRY H. OGREN
Assistant Project Leader

This study was initiated in September, 1960 to determine the seasonal movements of salt water game fish into and out of Louisiana's coastal salt and brackish waters. This work is being conducted in the coastal waters of the eastern section of Louisiana in St. Bernard Parish.

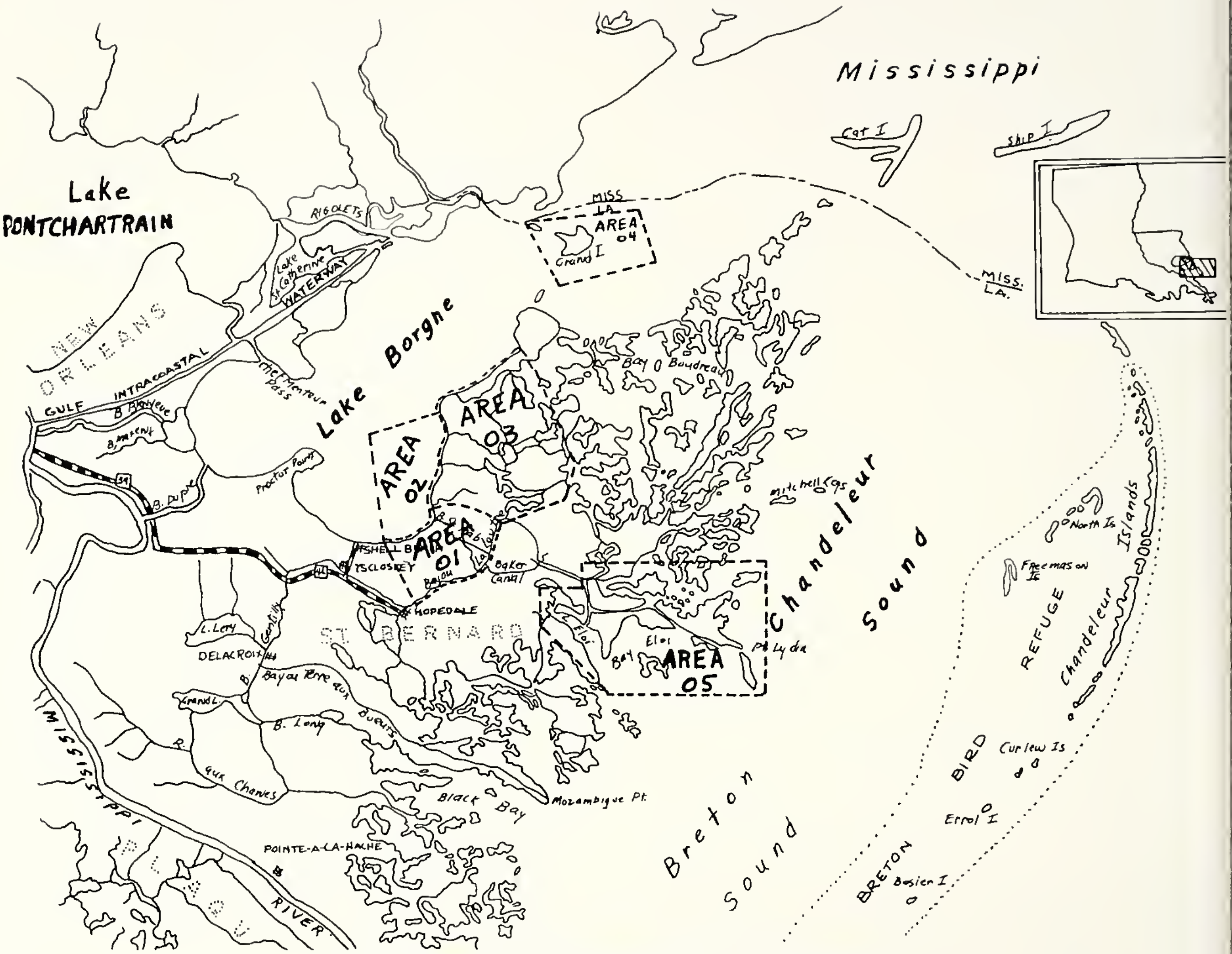
The period from September, 1960 to February, 1961 was devoted primarily to the determination of sampling methods and the location of sampling sites. Since that time scheduled sampling has been conducted in the five selected sampling areas. The following map illustrates these areas.

FISH POPULATION SAMPLING

This is one of the more important jobs in this study and considerable time and effort were devoted to a determination of adequate sampling methods. After experimentation it was decided to use the trammel net as the main sampling device. The normal method of fishing with this net was converted to a modification of the local commercial fishing technique. This includes attaching the net to the bank and placing it in the water in a semi-circle with the other end attached to the same bank. The enclosed water is then disturbed in an attempt to drive fish into the net. After this the net is pulled by one end along the shore until the two ends meet forming a circle. The net is then pulled into the boat as a seine,



Fish for scale samples are often collected by seining such as the seining operation on Clear Lake, Richland Parish, Louisiana.



Study Areas for Dingell-Johnson Project F8R

forming an even smaller circle until the entire enclosed area has been covered.

This method has proved very efficient because it takes any type of fish within the area, and it permits only a very limited number of fish within the sample area to escape. One or more such samples are collected in each sample area every three weeks using either a 200 or 400 yard trammel net. In the future, however, it is probable that only the 200 yard net will be used as this furnishes an adequate sample area and yet allows more locations to be sampled.

The fish collected by this method are identified and measured. In addition the game species are weighed, sexed, and the condition of the gonads recorded.

Periodic sampling with a cast net is conducted to give a qualitative sampling of the smaller fishes present.

Fish tagging has been conducted to a limited degree on representative species. The spotted weakfish is the species most frequently tagged. As yet this work has been too limited to afford any results.

The following tables show the results of the trammel net samples in the five sampling areas.

Area 01

SCHEDULED TRAMMEL NET FISH POPULATION SAMPLES

February 1961-June 1961

(Nine samples recorded; 200 yards net)

Date	*2-6**	*2-7**	*2-28*	*2-28*	*3-21*	*3-21*	*4-14*	*5-4*	*5-4*	*5-22*	*6-13*
SPECIES					*NUMBER OF FISH COLLECTED*						
Spotted weakfish	.....	.....	.....	6	.....	1	.....	1	.....	3	.....
Red drum	.....	.....	.....	.....	5	.....	.....	.....	.....	6	.....
Southern flounder	1	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Sheepshead	.....	.....	.....	.....	.....	3	2	.....	.....	4	.....
Striped mullet	3	150	16	2	70	2	23	.....	2	38	13
Spot	.....	.....	.....	.....	.....	10	8	10	.....	16	3
Croaker	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	3
Atlantic stingray	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....
Largescale menhaden	1	.....	.....	5	.....	.....	.....	3	.....	22	1
Atlantic needlefish	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Bull shark	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Sea catfish	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....
Bluegill sunfish	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....
Redear sunfish	33	12	96	18	84	7	65	7	8	8	1
Spotted sunfish	10	8	36	7	24	4	9	.....	1	.....	.....
Largemouth bass	2	.....	1	.....	2	.....	1	.....	.....	.....	.....
Spotted gar	3	4	169	2	17	5	8	.....	.....	2	.....
Alligator gar	1	2	12	9	4	4	6	1	.....	.....	1
Gizzard shad	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	1
American shad	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....

---

*380 net yards

Area 02

SCHEDULED TRAMMEL NET FISH POPULATION SAMPLES

February 1961-June 1961

(Fourteen samples recorded; 380 yards net)

Date	*2-2*	*2-2*	*2-17*	*2-20*	*3-1*	*3-1*	*3-16*	*4-5*	*4-5*	*4-19*	*5-3*	*5-23*	*5-24*	*6-23*
SPECIES						*NUMBER OF FISH COLLECTED*								
Black drum	1	8	.....	6	.....	2	.....	1	.....	.....	7	.....	3	1
Spotted weakfish	.....	.....	.....	5	6	7	4	4	1	9	48	4	38	10
Red drum	2	.....	1	3	8	33	2	8	1	5	1	.....	1	1
Hogchoker	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....
Southern flounder	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	2	.....	.....	.....
Sheepshead	.....	.....	.....	65	.....	1	.....	1	.....	3	.....	.....	.....	5
Striped mullet	127	104	12	15	1	17	13	19	47	11	1	7	22	5
Largescale menhaden	.....	.....	.....	6	.....	.....	.....	1	.....	11	4	1	5	.....
Spot	.....	.....	.....	1	.....	7	6	11	1	11	150	9	46	27
Croaker	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	48	19	33	43
Sea catfish	.....	.....	.....	.....	.....	.....	.....	1	39	96	.....	13	59	78
Pinfish	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	2
Atlantic stingray	.....	.....	.....	.....	.....	.....	.....	.....	1	2	.....	2	.....	.....
Bull shark	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	3
Redear sunfish	3	.....	33	4	4	14	2	3	.....	.....	.....	.....	.....	.....
Spotted sunfish	2	.....	11	.....	.....	5	1	.....	.....	.....	.....	.....	.....	1
Longnose gar	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....
Spotted gar	.....	.....	.....	.....	.....	2	2	1	.....	.....	.....	.....	.....	1
Alligator gar	.....	.....	.....	.....	1	.....	.....	3	.....	.....	1	.....	2	4
American shad	.....	.....	.....	.....	1	.....	.....	1	.....	2	1	.....	.....	.....
Gizzard shad	.....	.....	.....	.....	.....	39	.....	.....	.....	4	3	.....	1	2
Blue catfish	.....	.....	.....	.....	2	.....	1	.....	.....	1	.....	.....	.....	.....

Area 03

SCHEDULED TRAMMEL NET FISH POPULATION SAMPLES

February 1961-June 1961
(Twenty-three samples; 200 yards net)

Date	*2-21*	*2-21*	*2-23*	*3- 2*	*3- 2*	*3- 2*	*3-14**	*3-23*	*3-23*	*3-23*	*4-20*	*4-20*	*5- 2*	*5- 2*	*5-10**	*5-10*	*5-25**	*5-25*	*6- 5*	*6- 6*	*6-15*	*6-15*	*6-22*	*6-22*	*6-22*	*6-22*
SPECIES	*NUMBER OF FISH COLLECTED*																									
Black drum	..	..	..	..	..	..	2	2	1	..	..	2	9	..	..	..	..	1	..	1	..	..	..	..	3	..
Spotted weakfish	..	1	..	..	..	..	7	..	..	3	1	3	..	4	..	1	..	..	..	1	1	1	..	..	..	..
Red drum	..	..	..	..	..	1	..	3	6	1	7	2	..	..	3	2	..	1	2	1	..	..	1	..	2	..
Southern flounder	..	2	..	..	1	3	3	2	3	..	4	1	2	..	1	3	1	..	1	..	2	..	..	..	1	..
Sheepshead	1	..	..	..	..	..	6	2	..	1	2	..	1	..	1	2	..	..	..	1	1	..	..	..	..	..
Striped mullet	..	27	..	70	31	1	6	50	..	1	6	5	1	..	..	4	..	..	4	..	..	..	..	..	1	3
Pinfish	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..
Southern kingfish	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..
Croaker	..	..	..	..	..	..	..	..	..	..	..	..	4	7	..	2	5	10	..	1	4	3	1	..	1	1
Spot	1	..	..	..	..	..	9	..	3	8	7	8	84	43	19	1	11	4	..	2	10	57	1	6	..	..
Largescale menhaden	1	2	..	..	..	..	..	..	..	..	1	1	1	..	..	..	..	..	..	..	3	..	..	..	..	..
Atlantic stingray	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sea catfish	..	..	..	..	..	..	..	..	..	..	..	..	11	3	..	..	19	20	..	..	14	6	..	..	..	1
Gafftopsail catfish	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	3	..	..	..	..
Bull shark	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	2	..	..	..	..
Redear sunfish	..	11	3	4	2	17	..	1	14	20	26	9	..	..	5	..	..	..	..	..	..	..	4	3	..	..
Spotted sunfish	..	2	..	5	1	16	..	3	2	2	9	17	..	..	6	2	..	..	..	5	..	..	3	7	1	2
Largemouth bass	..	..	..	..	..	4	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Longnose gar	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	1
Spotted gar	..	2	..	2	..	3	..	2	4	3	7	3	..	..	1	1	..	..	..	6	..	..	3	3	..	..
Alligator gar	..	1	..	..	..	..	2	..	..	1	..	2	..	..	..	..	..	..	..	2	1	..	..	..	..	..
Gizzard shad	..	4	..	..	..	..	..	9	1	..	3	..	..	..	..	..	..	..	..	..	..	..	6	..	6	..

---

*380 yards net

Fisheries personnel conducting netting studies on Bussey Lake. Personnel from left to right: Dock Robertson, Seine Fisherman; Russell White, Biological Aide; and Nathaniel White, Seine Fisherman.

Area 04

SCHEDULED TRAMMEL NET FISH POPULATION SAMPLES

February 1961-June 1961
(Seven samples recorded; 380 yards net)

Date	*2-16*	*2-16*	*3-7*	*4-27*	*5-17*	*5-31*	*6-27*
SPECIES	*NUMBER OF FISH COLLECTED*						
Black drum	......	......	......	......	......	1	......
Spotted weakfish	......	......	6	19	3	49	7
Red drum	1	......	......	......	1	1	1
Southern flounder	......	......	......	1	......	......	1
Sheepshead	......	1	16	5	1	2	......
Striped mullet	1	16	1	11	26	2	2
Largescale menhaden	......	......	......	21	4	......	1
Sea catfish	......	......	28	17	21	34	16
Blue catfish	......	......	1	......	......	......	......
Gafftopsail catfish	......	......	......	2	2	......	1
Spot	......	......	7	11	24	20	108
Croaker	......	......	19	23	3	13	7
Atlantic stingray	......	......	......	......	......	2	......
Tripletail	......	......	......	......	......	......	1
Spanish mackerel	......	......	......	......	......	......	2
Tidewater silversides	......	......	......	......	......	......	1
Alligator gar	......	......	......	1	......	......	2

Area 05

SCHEDULED TRAMMEL NET FISH POPULATION SAMPLES

February 1961-June 1961
(Eight samples recorded; 380 yards net)

Date	*2-22**	*3-15*	*4-4*	*4-18*	*5-9*	*5-30*	*6-1*	*6-28*
SPECIES	*NUMBER OF FISH COLLECTED*							
Black drum	......	......	8	10	2	......	......	......
Sand seatrout	......	......	......	......	1	......	......	......
Spotted weakfish	......	11	12	40	3	3	2	1
Red drum	......	......	1	......	......	......	......	......
Sheepshead	......	1	......	1	4	1	......	......
Southern flounder	......	1	......	......	1	......	1	......
Striped mullet	1	3	39	70	2	2	1	2
Atlantic spadefish	......	......	......	......	2	......	1	......
Gafftopsail catfish	......	......	......	1	10	10	10	2
Sea catfish	1	26	17	42	126	99	113	70
Croaker	......	7	21	9	2	23	10	12
Spot	1	1	7	9	17	4	1	......
Largescale menhaden	1	......	1	......	8	108	102	15
Bull shark	......	......	......	38	......	4	1	......
Atlantic needlefish	......	......	1	......	......	......	......	......
Southern kingfish	......	......	......	......	......	......	1	......
Sea robin	......	......	......	......	......	......	1	1
Pinfish	......	......	......	......	......	......	......	1
Atlantic stingray	......	2	1	......	......	......	......	......
Gizzard shad	......	......	1	......	......	......	......	......
Alligator gar	......	1	......	5	3	1	1	......

---

*200 yards net

Biologist, Larry Ogren collecting cast net samples.

A flounder taken in a fish population sample being measured.

Catch taken in trammel net during fish population sampling.

Area 01

SCHEDULED WATER CHEMISTRIES
(February 1961-June 1961)

	Temp. °C		*Alkalinity (ppm)*					*Chloride Salinity*			
Date	*Air*	*Water*	*Carb.*	*Bicarb.*	*Total*	*pH*	*CO₂ ppm*	*ppm*	*ppt*	*Turbidity*	*Secchi Disc in ft.*
February 7, 1961	12.0	14.0	0	47	47	8.0	5	2619.9	5.9	—25	..
February 28, 1961	22.0	23.0	0	58	58	8.0	6	2211.3	5.2	—25	..
March 21, 1961	19.0	19.0	0	47	47	7.6	4	1191.8	3.4	—25	..
April 14, 1961	22.0	18.0	0	48	48	8.0	3	1271.3	3.8	200	..
May 11, 1961	25.0	23.0	6	43	49	8.3	0	1634.5	3.9	—25	..
May 23, 1961	26.0	25.5	0	93	93	8.0	5	4360.2	8.9	—25	..
June 13, 1961*	27.0	28.5	12	74	86	8.4	0	7935.6	15.0	—25	1.5
June 13, 1961	27.0	28.5	8	70	78	8.3	..	5711.9	11.4	—25	1.5

---

*Additional sample selected to ascertain effects of tide-water ship channel.

Area 02

SCHEDULED WATER CHEMISTRIES
(February 1961-June 1961)

February 3, 1961	8.0	9.5	0	46	46	8.4	1	2609.6	6.2	—25	..
March 1, 1961	24.0	19.0	0	40	40	8.3	3	1593.0	3.7	—25	..
April 5, 1961	26.0	21.0	0	43	43	8.4	2	1850.2	3.3	—25	..
April 19, 1961	23.0	21.0	0	39	39	8.3	..	953.5	2.9	36	..
May 23, 1961	31.0	27.5	6	38	44	8.2	0	1380.7	3.7	—25	..
June 23, 1961	30.0	28.0	0	42	42	8.2	1	1831.3	4.2	—25	3.0

Area 03

SCHEDULED WATER CHEMISTRIES
(February 1961-June 1961)

February 21, 1961	22.5	22.5	0	51	51	8.1	4	3117.7	6.7	—25	..
March 2, 1961	17.0	17.0	0	47	47	8.1	2	2430.4	5.4	—25	..
March 23, 1961	23.0	21.0	0	41	41	7.5	5	1328.0	3.7	27	..
April 20, 1961	23.5	21.0	0	42	42	8.4	2	839.9	2.6	—25	..
May 10, 1961	23.0	21.0	0	45	45	7.8	3	1067.0	3.3	36	..
June 5, 1961	30.0	28.0	0	47	47	7.8	2	1337.1	3.8	—25	..
June 22, 1961	25.0	26.0	0	35	35	7.3	6	1090.1	3.4	—25	2.0

Area 04

SCHEDULED WATER CHEMISTRIES
(February 1961-June 1961)

February 16, 1961	17.0	15.0	0	52	52	8.4	3	6849.7	13.1	—25	..
March 7, 1961	26.0	21.0	0	15	15	8.0	3	185.3	0.9	27	..
April 27, 1961	22.0	24.0	0	32	32	8.3	4	1967.5	4.6	36	..
May 17, 1961	25.5	23.5	0	34	34	8.0	3	1627.8	4.5	—25	..
May 31, 1961	28.0	26.0	0	45	45	8.2	1	3194.6	7.0	—25	3.0
June 27, 1961	27.5	27.0	0	45	45	8.3	1	3488.2	7.3	—25	..

Area 05

SCHEDULED WATER CHEMISTRIES
(February 1961-June 1961)

February 22, 1961	23.5	23.0	0	65	65	8.2	4	9821.2	18.0	—25	..
March 15, 1961	25.0	19.5	0	70	70	8.4	2	7973.9	18.0	—25	..
April 4, 1961	20.0	20.0	0	63	63	8.5	3	3821.4	8.4	—25	..
April 18, 1961	25.0	21.0	8	48	56	8.4	0	3064.7	6.7	—25	..
May 9, 1961	22.0	23.0	6	69	75	8.4	0	7860.4	14.9	44	..
June 1, 1961	28.0	27.0	4	73	77	8.3	0	8622.4	17.4	—25	1.5
June 28, 1961	30.0	27.5	4	65	69	8.3	0	7892.0	15.0	—25	2.5

STOMACH ANALYSES AND FISH FOOD POPULATIONS

Stomach samples are collected from game fish every third fish population sampling period. During this biennial only a limited number of stomach contents have been analyzed. Upon analysis the results of this job will be compared with the food organisms available to better evaluate the food preferences and feeding habits of our coastal game fishes.

The sampling for the fish food organisms is conducted in the same locality and immediately after the sampling of the fish population from which the stomach samples are taken. This sampling is conducted with an 8 foot bobbinet trawl with drags consisting of 1 to 5 minutes depending upon the density of the population being sampled.

CHEMICAL AND PHYSICAL CHARACTERISTICS

At the same time the fish population sampling is conducted in each sampling area, field water chemistries are run. These include the determination of free carbondioxide, carbonate and bicarbonate alkalinity, and pH. Also, physical characteristics including air and water temperature, tide and secchi-disc readings are recorded. Water samples are brought to the New Orleans laboratory for salinity, chloride, and turbidity analyses.

It is the purpose of this job to attempt to determine if a given set of chemical and physical characteristics are a pre-requisite for the abundance of game fish species in our coastal waters.

The following tables present the scheduled water chemistries from the five sample areas:

Method of taking plankton sample. Ten gallons of water are pumped into can (pump in left background). Water is then filtered through plankton net.

Aerial view of Amite River showing the channel straightening. The loop on the left is the old channel.

DINGELL-JOHNSON PROJECT F-9-R

"An Ecological Survey of Factors Affecting Fish Production in a River and Backwater Area"

THOMAS D. ALLEN, JR.

Project Leader

Project F-9-R was inaugurated July 1, 1960. The project consists of six different jobs and when completed should give needed information as to the normal ecological conditions of the Spring Bayou backwater and the Amite River.

The Spring Bayou backwater area is located in the flood plains of Avoyelles Parish with an approximate size of 1,500 acres. The area is made up of several lakes of various shapes and sizes. The majority of the lakes are permanent bodies of water; however, they vary considerably in depth depending upon the amount of backwater from the Red River. Until the spring of 1955, when the Department of Public Works constructed a dam in Little River, the majority of the lakes were not permanent water bodies. The purpose of the dam was to stabilize the water level in the many lakes and provide an access area to excellent fishing the year round. Instead of the supposed access, the stabilized water level favorably influenced the growth of *Ceratophyllum* sp. and *Potamogeton* sp. to such an extent that the area is practically non-navigable in the summer months. The majority of the lakes vary in depth from 8 or 9 feet in the late winter and spring to approximately 2 to 4 feet in late summer.

Dead trees and stumps which were killed by annual flooding are numerous through out the area with some stands of baldcypress *(Taxodium distichum)*, and button bush *(Cephalanthus occidentalis)* found in the lakes. The land ajoining the many lakes supports a dense growth of many woody plants.

The amount of aquatic plants such as coontail and narrow leaf Potomageton in the lakes during the summer months appears to be directly proportional to the amount of backwater coming into the area the prior winter and spring.

The Amite River originates in the southern part of Mississippi and empties into Lake Maurepas with approximately 90 miles flowing through the southeastern section of Louisiana.

It varies in size and depth depending upon the location and season of the year. The first sampling station located near Grangeville is approximately 100 feet wide and ranges in depth from 3 feet in the late summer to 8 or 9 feet in late winter and early spring. Occasionally each year during times of excessive rains the high water exceeds the banks of the river causing some flooding in the surrounding area. At the present time the United States Army Engineers has a channel alignment project on the river in order to prevent flooding in the adjacent areas of the Amite River.

In the past the Amite River has offered some of the best stream fishing in the state. It is noted for its fine yellow bass run in the spring months as well as other species, year round.

STUDY OF CHEMICAL AND PHYSICAL FACTORS

Each month at predetermined stations, chemical analyses are conducted for the amount of dissolved oxygen, free carbon dioxide, alkalinity and pH. Dissolved oxygen, one of the essential for fish life, often times varies greatly from one lake to another in the Spring Bayou backwater area. It was found one month that in one body of water practically no dissolved oxygen was present while several hundred yards away there would be as much as 7.0 ppm. While a great decrease in free oxygen has a marked influence upon fish life, a large increase seems to have very little influence. There are many physical and chemical factors that influence the amount of oxygen present.

Carbon dioxide is also an important gas in fresh water. In small quantities it is essential, rather than detrimental to aquatic life. Yet, in large quantities, it is a lethal factor, especially if the dissolved oxygen content is low. Ordinarily accumulations in natural waters do not reach such lethal amounts.

Monthly water samples are collected, preserved by freezing, and are returned to the New Orleans laboratory for analysis of total and available phosphates, ammonia nitrogen, organic nitrogen, nitrate nitrogen, and nitrite nitrogen. In order for a lake to be very productive, it is first necessary for the body of water to have the above elements and in sufficient amounts. Just as plant growth on land requires nitrates and phosphates in order to grow and be productive, it is equally as important to have them in the water to produce a good growth of microscopic plants and animals for fish food.

Physical analysis of water samples for turbidity and color, along with temperature recordings of both air and water are conducted each month in the two bodies of water under study.

AMITE RIVER

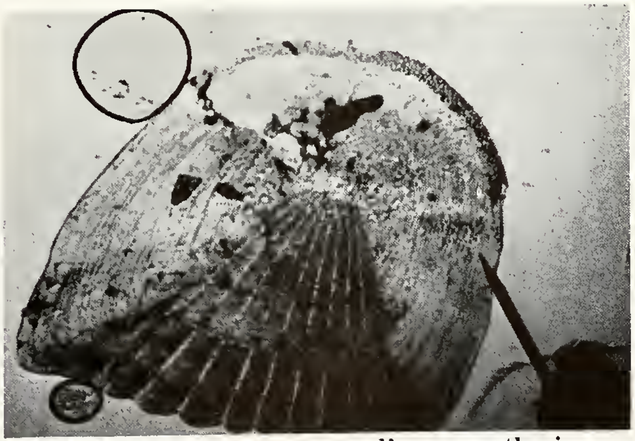
Field Water Chemistries Yearly Averages (Recorded in degrees centigrade and parts per million)

	Temperature				*Alkalinity*			
	Surface	*Bottom*	*Oxygen*	*CO*	*ph-th*	*MO*	*pH*	*Secchi Disc in ft.*
I	22.1	21.9	6.2	11.7	0.0	33.3	6.4	0.99
II	22.5	21.7	6.6	12.5	0.0	38.7	6.1	0.46
III	22.5	21.6	6.5	10.4	0.0	41.0	6.3	0.44
IV	22.0	21.4	6.5	12.3	0.0	41.5	6.1	0.25
V	22.2	21.6	6.6	15.0	0.0	40.8	5.9	0.96

SPRING BAYOU AREA

Field Water Chemistries Yearly Averages (Recorded in degrees centigrade and parts per million)

	Temperature				*Alkalinity*			
	Surface	*Bottom*	*Oxygen*	*CO*	*ph-th*	*MO*	*pH*	*Secchi Disc in ft.*
I	21.2	21.0	3.2	16.1	0.0	63.5	6.5	1.7
II	21.1	21.1	4.8	15.3	0.0	68.4	6.7	1.9
III	21.4	21.2	5.7	14.7	1.3	62.0	6.9	1.7
IV	21.2	21.1	5.5	16.3	0.0	65.6	6.6	1.8



The marker points to an annuli or growth ring on the projected image of a redear sunfish scale.

PLANKTON STUDIES

This phase of the project deals with the small plant and animal organisms found free floating in the water. These free floating organisms are the first in a series of food items of a lake's food chain that are taken by fish. Plankton is of great importance in the diet of a young fish. The success or failure of a fishery is influenced directly by the abundance and distribution of plankton. The fate of many fish immediately after hatching depends upon a plentiful supply of these microscopic plants and animals.

The samples are taken at a depth of three feet with the use of a portable power pump. At each sampling site a one-liter net filtered nanno-plankton sample and two twenty-liter net-plankton samples are collected. One of the two net-plankton samples is preserved in alcohol for subsequent laboratory gravimetric analysis, and the other net-plankton sample is preserved in formalin for qualitative analysis. The nanno-plankton are the smaller plants and animals that are able to pass through a plankton net made of No. 20 standard silk bolting cloth with 173 meshes to the inch.

The table below shows a yearly average for the plankton most numerous:

NET PLANKTON YEARLY AVERAGE AMITE RIVER

September, 1960-June, 1961 (Recorded in average number per liter.)

	SECTION				
Organism	*I*	*II*	*III*	*IV*	*V*
Rotifers	44.4	50.0	100.0	210.0	288.9
Chlorophyta	123.9	50.0	190.0	480.0	1133.3
Chrysophyta	266.7	50.0	50.0	10.0	0.0
Cyanophyta	44.4	0.0	20.0	10.0	0.0
Pyrrhopyta	11.1	0.0	20.0	0.0	22.2
Desmid	22.2	0.0	50.0	10.0	33.3

NET-PLANKTON YEARLY AVERAGE SPRING BAYOU BACKWATER AREA

September, 1960-June, 1961 (Recorded in average number per liter.)

	SECTION			
Organism	*I*	*II*	*III*	*IV*
Rotifers	150.0	380.0	355.6	250.0
Chlorophyta	492.1	668.2	521.7	331.7
Cyanophyta	130.0	222.6	88.9	70.0
Euglenophyta	110.0	110.0	55.6	120.0
Pyrrhophyta	30.0	30.0	0.0	30.0
Cladocera	6.7	21.2	4.4	11.6
Copepods	12.1	20.5	11.8	8.5
Nauplius	19.5	21.4	22.4	16.2
Ostracoda	0.2	0.5	0.0	0.2

James Baur, creel census clerk, gathering information on sport fish harvest on Bayou D'Arbonne.

BOTTOM FAUNA STUDIES

Bottom fauna includes all organisms living on or in the bottom of a body of water. Benthos constitute a large portion of the diet of many of the game fish as well as other fish. Benthos sampling is done quarterly in the same location with the use of Petersen dredge and washed in a No. 30 sieve.

The number and size of these organisms may vary greatly from one section of a lake to another depending upon the depth, soil type, chemical and physical condition of the lake, seasons of the year and several other factors.

Station number one on the Amite River, which is located near its head waters, has an average depth of about three feet and a bottom type of gravel and sand. Here only an average of 0.12 aquatic earthworms, Tubificidae, were found to be present per Petersen dredge sample. Station number five, located near the river's mouth, has a depth of about 18 feet and a bottom type of pulpy peat and muck was found to have an average of 59.88 Tubificidae per Petersen dredge sample.

BENTHOS ORGANISM DISTRIBUTION

Amite River—Station 1 through 5 Yearly Average for Four Sampling Trips

September 1, 1960-June 30, 1961 (Average of Channel and Bank Samples)

	STATION				
Organism	*I*	*II*	*III*	*IV*	*V*
Tubificidae	0.12	59.88	68.25	54.38	259.00
Ephemeridae	3.00	0.62	0.12	0.00	0.00
Baltidae	2.62	0.38	0.00	0.00	1.88
Tendipedidae	2.25	20.00	6.75	8.50	15.38
Viviparidae	0.00	2.25	0.00	0.50	0.00
Unionidae	0.00	2.75	0.00	0.00	0.00
Chaoborinae	0.00	0.75	2.38	2.75	45.88

Parking lot at Bussey on opening day, April 30, 1960, just 30 minutes after the reservoir was officially opened.

SPRING BAYOU AREA

Yearly Average for Four Sampling Trips
September 1, 1960-June 30, 1961
Average of Four Samples

Organism	*Yearly Average*
Tubificidae	28.00
Talitridae	6.81
Chaoborinae	47.75
Tendipedidae	34.56
Ceratopogonidae	2.19
Gammaridae	3.75

ABUNDANCE OF YOUNG FISH OF THE YEAR

The objectives of this job are to determine the annual spawning success of the fish population in the selected areas and to compare the spawning success of the game species with that of the rough or trash species.

The reproduction samples from the Amite River were taken with a 39 foot nylon bobbinet seine. Six 600 square foot samples were collected and an average of the six samples are presented in the table below. Sampling in the backwater area was done by applying rotenone to an area of approximately 600 square feet. This method was used because the dense growth of aquatic plants prohibited the use of a seine. Given below is an average of four rotenone samples from Spring Bayou Area.

AMITE RIVER

Reproduction Study
June 21, 1961
(Average of six samples)

	Number of Fish				
Length in Inches	*Spotted bass*	*Largemouth bass*	*Black crappie*	*Bluegill sunfish*	*Longear sunfish*
1.0	2.0	....	1.8	....	....
1.5	1.3	....	....	....	....
2.0	1.1	....	6.1	0.1	0.1
2.5	....	....	1.6	....	....
3.0	....	0.1	0.1	....	....
3.5	....	....	....	....	....
4.0	....	....	....	0.1	....
4.5	....	....	....	....	....
5.0	....	....	....	....	....
Total No.	27	1	58	2	1

Trammel net being placed in water for fish population sampling. The boat is propelled with oars in order to disturb the area as little as possible.

SPRING BAYOU BACKWATER AREA

Reproduction Study

June 28, 1961

(Average of four samples)

	Number of Fish							
Length in Inches	*Largemouth bass*	*Bluegill sunfish*	*Redear sunfish*	*Longear sunfish*	*Warmouth*	*White crappie*	*Black crappie*	*Orange spotted sunfish*
1.0	...	1.2	...	...	...	...	...	...
1.5	2.2	...	...	...	1.2	3.7	...	1.0
2.0	...	2.2	...	...	1.5	8.0	...	...
2.5	...	2.0	...	...	...	...	...	...
3.0	1.2	2.5	...	0.2	0.5	3.2	0.5	0.2
3.5	...	...	...	...	...	...	...	...
4.0	0.2	1.0	1.2	...	0.2	...	...	...
4.5	0.2	...	...	...	...	...	...	...
5.0	...	...	...	...	...	...	...	...
Total No.	16	36	5	1	14	60	2	5

FISH FOOD STUDIES

Fish food studies are accomplished by the extraction of fish stomachs usually at the time the population samples are conducted. The contents present in the stomachs are examined and identified as to the kind and number of organisms.

With such information, fisheries personnel are able to determine the preferred food of fish. A correlation between the bottom fauna present in the lake and the organisms being utilized by the fish may also be obtained.

Progress in this particular job is not far enough along to report any of the above information at this time.

POPULATION STUDIES

Fish population samples were taken from the two areas under study with the use of a chemical called rotenone. Six one-acre samples were taken in the backwater area and three were taken in the Amite River. A seine of one-inch mesh webbing was used to enclose the acre and the rotenone was distributed evenly throughout the area. As the fish surface, they are picked up, weighed, measured and counted.

The Spring Bayou backwater area was found to have an average of approximately 316.6 pounds per acre of fish. Of the above total fish per acre, 58.6% or 185 pounds per acre were game species. Bluegill sun-fish, five inches or longer, made up 27% of the total population.

Results of the Amite River samples are not presented in this report.

DINGELL-JOHNSON PROJECT F-10-R AGE AND GROWTH STUDIES

VICTOR W. LAMBOU

Project Leader

JOANN WILLIAMS

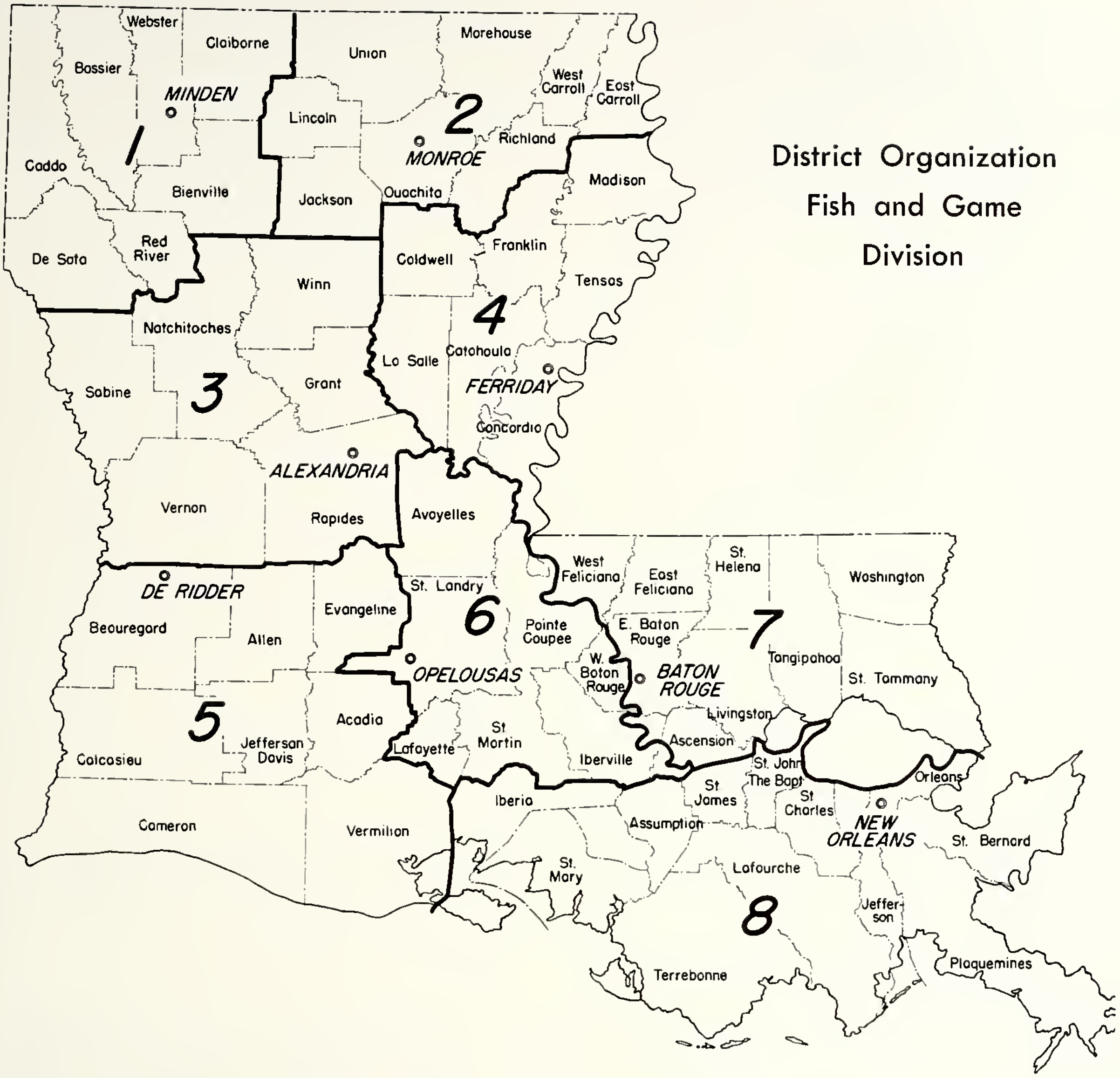
Biologist Aide

On July 1, 1961 Dingell-Johnson Project F-10-R (Age and Growth Studies) was initiated in order to gather basic information relative to age and growth of the more important game fishes in Louisiana. A knowledge of the age and growth of fishes is extremely useful in the management of fisheries and in the evaluation of management policies. This project has the objective of determining the validity of the scale method in Determining Age and Growth Rates of Fishes in Louisiana and, if the method is valid, to determine the age and growth of the more important game fishes. Also the length-weight relationships of fishes will be determined.

The scale method of aging fish is based on the assumption that during the colder months, when growth ceases or slows down, that an annulus or ring is formed on the scales of fish after each annual growing season. Each of these rings represents one year of growth. The distance between these rings indicate the rate of growth for that particular year; and it is possible to calculate the rate of growth for previous years, by comparing the distance between rings with the length of the fish.

Because of the mildness of the climate in Louisiana it is possible that annuli may be laid down in an irregular manner and be hard or impossible to read. It is also possible that there will be differences in our ability to age fishes from different habitat types and different areas of the state. An attempt will be made to determine what species and/or what areas of the state the scale method will apply to. Attempts will be made to determine the growth rates of the more important fresh water fishes from various areas of the state and from different habitat types. At the same time, attempts will be made to determine the length-weight relationship for the species of fish for which age and growth studies were conducted.

Considerable progress has been made in realizing of the projects' objectives, however, much of the data accumulated has not been analyzed fully, and has not been reported. These will be presented in the next biennial report.



District Organization
Fish and Game
Division

LOUISIANA WILD LIFE AND FISHERIES COMMISSION FISH & GAME DIVISION

123 Wild Life & Fisheries Bldg., 400 Royal St.,
New Orleans 16, La.
Phone 523-1981

John D. Newsom, Chief, Fish & Game Division, 655 Hailey Ave., Slidell, La., 1373 and T. B. Ford, Asst. Chief, Fish & Game Division, 1204 Henry Clay Ave., N. O., La., TW 9-8922.

PITTMAN-ROBERTSON SECTION-HEADQUARTERS-NEW ORLEANS

John D. Newsom, P-R Coordinator, Charles R. Shaw, Asst. P-R Coordinator, Rt. 2, Box 217-A, Slidell, La., 10-23 XR, and Morton M. Smith, Waterfowl Study Leader, 600 Julius Ave., N.O. 21, La., VE 4-5793.

DISTRICT I-HEADQUARTERS-MINDEN

117 Pearl St., Minden, La. P.O. Box 224
Phone FR 7-3575

John L. Haygood, Supervisor, District I, 2848 Lobelia Ave., Baton Rouge, La.; James H. Taylor, Biologist, 519 Sullivan St., Apt. 1, Minden, La.; Kinsey D. Martin, Supervisor, Bodcau G.M.A., Rt. 3, Box 110, Minden, La., FR 7-5276; Floyd Sizemore, Supv., Jackson-Bienville G.M.A., P.O. Box 304, Quitman, La., 5616 and Lloyd E. Posey, Jr., Biologist (Fisheries), 811 Madison St., Minden, La., FR 7-6284.

DISTRICT II-HEADQUARTERS-MONROE

Monroe Fish Hatchery, Sterlington Road
P.O. Box 4004, Ouachita Station Monroe, La.
Phone FA 5-8266.

Clifford T. Williams, Supervisor, District II, 3900 Lionel St., Monroe, La., FA 5-7920; Curtis L. Hollis, Supervisor, Union Parish

G.M.A., Rt. 3, Box 79, Marion, La., CY 2-4111 and James T. Davis, Biologist (Fisheries), 508 Baker St., Monroe, La., FA 5-8931.

DISTRICT III-HEADQUARTERS-ALEXANDRIA

Hwy. 71, North (next to Springhill Crts.)
P.O. Box 1041, Alexandria, La.
Phone HI 2-1384.

Clyde E. Harrison, Supervisor, District III, Rt. 2, Box 147, Pineville, La., HI 3-2356; Robert E. Murry, Project Leader & Quail & Turkey Study Leader, 1103 Kings Road, Leesville, La., 2050; Louis E. Brunett, Deer Study Leader, Rt. 1, Box 198-J, Pineville, La., HI 5-5751; Jack O. Collins, Rabbit Study Leader, 1420 Ransbottom Drive, Alexandria, La., HI 5-2228; Rowland P. Vernon, Biologist, Rt. 2, Box 446-U, Pineville, La., HI 3-7191; Raymond Palermo, Biologist, Rt. 2, Box 45, Alexandria, La.; Horace E. Stiles, Supervisor, Evangeline G.M.A., P.O. Box 1973, Alexandria, La., HI 2-7057; Volmer Bowen, Supervisor, Catahoula G.M.A., P.O. Box 562, Winnfield, La., 4096; Wm. L. Alford, Supervisor, Sabine G.M.A., P.O. Box 145, Fisher, La.; H. Carmen Beasley, Supervisor, Red Dirt G.M.A., Star Route, Provencal, La.; Leslie Davis, Supervisor, Ft. Polk G.M.A., Simpson, La., 8609; Woodrow Smith, Superv., Lutcher-Moore G.M.A., Evans, La.; Sammy N. Stokes, Biologist (Fisheries), P.O. Box 547, LeCompte, La., PI 8-3230 (Glenmora) and Gilbert Sanson, F&G Refuge Warden, Catahoula Lake, Deville, La., 3-8963 (Alexandria).

Predator Control Section

T. E. "Doc" Harris, Supervisor, P.O. Box 116, Goldonna, La., 5184 (Winnfield).

DISTRICT IV-HEADQUARTERS-FERRIDAY

Waterproof Highway (5 miles north),
P.O. Box 426, Ferriday, La.
Phone 757-4571

Dewey W. Wills, Supervisor, District IV, P.O. Box 220, Ferriday, La., 757-3925; Robert B. Kimble, Biologist, P.O. Box 426, Ferriday, La., 757-4707; Dan Dennett, Deer Study Leader, P.O. Box 426, Ferriday, La., 757-4732; Welch W. Lively, Supervisor, Caldwell G.M.A., Columbia, La., 6719; James M. Perritt, Supv., Chicago Mill G.M.A., No. 1, Newellton, La.; R. T. Williams, Supv., Chicago Mill G.M.A. No. 2, 1404 Florida St., Tallulah, La., 1862-J; Thomas D. Allen, Jr., Biologist (Fisheries), P.O. Box 524, Ferriday, La., 757-4177; Oran Lewis, F&G Refuge Warden, Rt. 1, Box 159, Delhi, La., RA 2-3575, Crowville, La. and W. V. Ferrington, F&G Refuge Warden, Rt. 1, Wisner, La., 2144.

DISTRICT V-HEADQUARTERS-DeRIDDER

DeRidder Airport, P.O. Box 405, DeRidder, La.
Phone 6111

Jack A. Sims, Supervisor, District V, P.O. Box 405, DeRidder, La., 6640 and Elbert E. Garlington, Supervisor, West Bay G.M.A., Rt. 3, Box 56, Pitkin, La., ME 4-5906 (Elizabeth, La.).

DISTRICT VI-HEADQUARTERS-OPELOUSAS

225 No. Union St., P.O. Box 585, Opelousas, La.
Phone 942-7848

J. B. Kidd, Supervisor, District VI, 314 W. Cheney St., Opelousas, La., 942-6779 and Lawrence D. Soileau, Dove Study Leader, 316 W. Cheney St., Opelousas, La.

DISTRICT VII-HEADQUARTERS-BATON ROUGE

6350 Perkins Rd., P.O. Box 14526,
Southeast Station, Baton Rouge, La.
Phone DI 3-2838

Henry D. Roberts, Supervisor, District VII, Rt. 4, Lovett Road, Baton Rouge, La., EL 6-2150; Kenneth C. Smith, Project Leader 30-D, 9137 Oliphant Rd., Baton Rouge, La., WA 1-0620; Thomas W. Chatham, Biologist, 3319 Lorraine St., P.O. Box 14526 Southeast Sta., Baton Rouge La., EL 5-8320; Fred Joiner, Supervisor; Zemurray G.M.A., Rt. 1, Box 485, Ponchatoula, La., 9242; Lloyd Cutrer, Beaver Trapper, P. O. Box 232, Kentwood, La., 8382 and Victor W. Lambou, Biologist (Fisheries), 4717 Orchid St., Baton Rouge, La., DI 3-6760.

Aquatic Vegetation Control

Fred L. Myers, Federal-State Coordinator, 4785 Mimosa St., Baton Rouge, La., DI 3-4591; J. G. Dutton, Field Supervisor, 4036 Palm St., Baton Rouge, La., DI 4-5761 and P.O. Box 6, Rosedale, La., MI 8-3712 (Rosedale) and Virgil T. Lapham, Biologist, P.O. Box 233, Denham Springs, La.

DISTRICT VIII-HEADQUARTERS-NEW ORLEANS

Phone 523-1981, Ext. 20 & 28

Robert A. Beter, Supervisor, District VIII, Route 2, Box 216N, Slidell, La., 407-J and Jerry W. Farrar, Biologist, Rt. 2, Box 95, Lillie, La.

Fisheries Section

Phone 523-1981, Ext. 25 & 26

Harry Schafer, Jr., Superv., Fisheries Section, 248 Citrus Road, N.O. 23, La., 729-3787; Donald Geagan, Biologist, 605 N. Bengal Road, Metairie, La., 729-8020; Max W. Summers, Biologist (River Basins), 1504 Antonine St., New Orleans, La., TW 1-2828 and Larry H. Ogren, Biologist, 1504 Antonine St., New Orleans, La., TW 1-2828.

PROJECT FW-2R-RESEARCH DESIGN & ANALYSIS-BATON ROUGE

Room 305, Old Peabody Hall, Baton Rouge, La.
Room 307, Old Peabody Hall, Capitol Station
Phone DI 4-1282

Herbert Stern, Jr., Project Leader, 6830 Menlo Drive, Baton Rouge, La., DI 3-6803.

Fur Division

TED O'NEIL
Chief

TED O'NEIL

THE FUR DIVISION is responsible for the promotion and development of the state's fur industry and the conservation of the state's furbearing animals.

Where are we now in the fur, or should we say nutria dilemma? The situation is not as hopeless as it has been. This will come as a surprise to most people, in view of all the adverse publicity the nutria has had.

In the past nutria was strictly a speculative item, but it is now being used on a much sounder basis. This has not just happened. It has cost fortunes and unestimated efforts of a number of the greatest and most successful fur men in this country and abroad. The reason for such feverish efforts is the same old story. Nature has created an abundance, as it often does on the Louisiana coast, impelling men to seek methods of converting such into profit.

Credit is due those individuals and organizations that have so generously contributed toward helping solve this state's knotty problem that started with the importation of 13 Argentina animals into Louisiana intended for ranching purposes. The offspring of these animals that escaped into the marshes started Louisiana's notorious nutria population. Already the demand for nutria meat exceeds the supply and it is antic-

This is typical Louisiana marsh habitat; Louisiana is blessed with millions of acres of marshland.

This swampland trapper has located deep set.

Good colored Raccoons are presently in demand by industries in the cloak trade.

This trapper of North Louisiana is removing a mink from a trap. Trapping methods differ in various sections of the state.

This is the habitat in which the Louisiana upland trapper operates. There are three different and distinct trapping areas in the state: the marshes, deep cypress and tupelo gum swamp, and the uplands. Techniques and methods vary in each habitat area.

ipated that such a demand for the pelts will be created in the not too distant future.

During the past eight years many attempts have been made by the Fur Division to promote the fur industry in Louisiana. In 1954, at the request of the Wild Life & Fisheries Commission, a successful mouton dresser of New York came to Louisiana and offered a solution in the form of a cooperative, with landowner, operator and trapper participation. In 1956, again at the request of the Commission, two successful furriers and promoters came to Louisiana and offered a plan for marketing and promotion of the entire crop of the Louisiana nutria. In 1958 one of the most successful designers and promoters in the world from New York, offered the state a plan which is comparable to the plan that has worked so successfully for the mink and chinchilla ranchers. In 1960 another plan was offered to incorporate fur dressing along with promotion and sale of raw pelts, to be participated in by the landowners, operators, trappers and dealers. The most recent plan was offered in 1961 by a New York firm that has dealt primarily in Louisiana furs for many years. This plan also incorporated promotional work, starting on a small scale, graduating to meet the needs.

Any of the above plans would have been successful; at least to the extent of getting the Louisiana fur industry "off the ground" starting this important part of our economy back on the road to recovery. Unfortunately all of the above plans called for a certain amount of state participation financially. During most of this time the nutria population was at its peak and the agricul-

Louisiana's first fur dressing plant. The modern facility is located at St. Rose in St. Charles Parish.

tural interests along our coast was determined to place the nutria on the outlaw list, hoping this would solve their nutria damage problem. This controversy prevented favorable action toward the fur industry.

Each attempt at promotion served the trappers and landowners somewhat in varying degrees by stimulating speculative buying. The dealers and buyers all felt that any activity along a promotional line would be reflected in a rise in the raw pelt price. The majority of local dealers and several of the out of state dealers each year have taken on quantities of pelts with rather disasterous results in most cases.

Now two things are apparent. Any plan to incorporate the entire fur industry in Louisiana and all of its participants, is an extremely difficult undertaking due to so many different personal opinions, attitudes and ideas. Any operation of promotion, dressing and marketing of raw pelts that meets with success on any scale, no matter how small, will be the starting of a new era in the fur industry in Louisiana. Instead of one large operation, a number of small units will result, giving every area an opportunity to search for its needs.

For this new era to be successful and remain so, the nutria will have to be removed from the outlaw list and funds will have to be provided for use in a fur promotional program. Our fur severance tax would be one fair means of providing these funds even though it is a small amount at this time. As the industry grows, this fund would also grow and would be a continued source of revenue. The continual and growing success that mink ranchers enjoy is due to a fund that is collected from the sale of ranch raised pelts which is used for promotional purposes exclusively. But so long as our nutria remain on the outlaw list, no amount of promotion will be completely successful as a large percentage of inferior pelts will be produced and placed on the market. Muskrats should also be included in any promotional program initiated.

If the state provides the industry with funds, the money should be used to promote Louisiana muskrats as well as nutria.

ALLIGATORS

The 1958 Legislature passed the first measures toward the protection of the Louisiana Alligators; prohibiting the taking of animals under (5) feet in length, and authorizing the Louisiana Wild Life & Fisheries Commission to set season, methods and areas to be taken.

The Commission allowed the taking of alligators from April 15th to June 15th 1961 in South Louisiana-starting from the Louisiana-Texas line Highway 90 to Iowa Highway 165, to Forrest Hill Highway 112 to Lecompte Highway 71, to Krotz Springs Highway 190, to Slidell and Highway 11 to the Mississippi line. Alligators are protected in other areas of Louisiana.

NUTRIA MEAT

An estimated ten million pounds of frozen Nutria carcasses were shipped to the Mink Ranchers throughout the United States during the 1960-61 Season. Nutria meat has been developed into one of the most important sources of red meat for Mink feeding.

The following tables demonstrate the comparison between the Louisiana fur industry as it was at its peak and as it is at present.

NUMBER OF FUR LICENSES SOLD

1953-54 Season Through 1960-61 Season

Class of License	*1953-54*	*1954-55*	*1955-56*	*1956-57*	*1957-58*	*1958-59*	*1959-60*	*1960-61*
Res. Fur Buyer	163	147	134	133	125	124	126	125
Res. Fur Dealer	27	21	20	21	21	18	18	13
Non-Res. Fur Buyer	1	1	....	....	....	....	1	....
Non-Res. Fur Dealer	1	1	2	2	3	3	4	3
Trapper	4,986	5,202	5,520	4,260	3,868	3,932	3,747	3,613

1946-1947 Season

Muskrat	8,029,764	@	$ 1.00	$ 8,029,764.00
Nutria	18,015	@	3.00	54,045.00
Mink	153,027	@	5.00	765,135.00
Raccoon	186,750	@	1.50	280,125.00
Opossum	77,264	@	.60	46,358.40
Otter	2,832	@	12.50	35,400.00
Skunk	4,830	@	.50	2,415.00
Fox	2,645	@	.50	1,322.50
Cat	383	@	.50	191.50
Miscellaneous	53	@	.50	26.50
Total	8,475,563			$ 9,214,782.90

1947-1948 Season

Muskrat	5,794,317	@	$ 1.50	$ 8,691,475.50
Nutria	28,176	@	3.00	84,528.00
Mink	153,120	@	15.00	2,296,800.00
Raccoon	126,933	@	1.00	126,933.00
Opossum	31,744	@	.70	22,220.80
Skunk	1,415	@	.70	990.50
Otter	5,078	@	18.00	91,404.00
Fox	2,528	@	.50	1,264.00
Cat	70	@	.50	35.00
Miscellaneous	679	@	.50	339.50
Total	6,144,060			$11,315,990.30

1958-1959 Season

Muskrat	1,302,606	@	$ .80	$ 1,042,084.80
Mink	88,365	@	8.00	706,920.00
Raccoon	68,139	@	1.00	68,139.00
Otter	5,166	@	14.00	72,324.00
Nutria	461,311	@	1.00	461,311.00
Opossum	3,660	@	.10	366.00
Fox	33	@	.25	8.25
Skunk	623	@	.15	93.45
Cat	126	@	.25	31.50
Total	1,930,029			$ 2,351,278.00

1959-1960 Season

Muskrat	1,531,788	@	$ 1.20	$ 1,838,145.60
Mink	58,838	@	8.00	470,704.00
Raccoon	80,814	@	1.50	121,221.00
Otter	5,559	@	18.00	100,062.00
Nutria	694,110	@	1.10	763,521.00
Opossum	9,498	@	.25	237,450.00
Skunk	524	@	.25	131.00
Fox	123	@	.50	61.50
Cat	252	@	.50	126.00
Total	2,381,506			$ 3,531,422.10

1960-1961 Season

Muskrat	961,287	@	$ 1.10	$ 1,057,415.70
Mink	32,272	@	7.00	225,904.00
Raccoon	65,588	@	1.50	98,382.00
Otter	3,602	@	17.00	61,234.00
Nutria	716,435	@	1.00	716,435.00
Opossum	11,450	@	.40	4,580.00
Fox	165	@	.50	82.50
Skunk	388	@	.40	155.20
Cat	39	@	.50	19.50
Total	1,791,226			$ 2,164,207.90

Trapper Bill Maddox is shown as he prepares a a predator animal set.

Oysters, Water Bottoms And Seafoods Division

JAMES N. McCONNELL
Chief

JAMES N. McCONNELL

The Division of Oysters, Water Bottoms and Seafoods has made much progress during the past Biennium.

Considerable advance has been made in scientific research as shown by the report from our biological section. From information that we now have and expect to accumulate during the coming year it seems quite probable that we will soon be able to prognosticate the probable size of the crops in both the shrimp and oyster populations. This advance information will be of great benefit to both industries, and to the individual fisherman as well.

The intense interest shown by teachers of science and high school and college students who attend short term field trips to our laboratory on Grand Terre Island should be specially noted.

It is also of real interest to our fishermen of both oysters and shrimp to note that in spite of the tremendous increase in industrial activities in our coastal waters, complaints from seismograph operations have dropped to zero in the 1960-61 period. Losses from silting and dredging have remained about the same in spite of the increase in the laying of pipe lines, drilling operations, etc. It will also be noted that most of these complaints originate from contractual operations and the carelessness of oil company field personnel against the policy of the company itself.

SHRIMP PRODUCTION

The low shrimp production during 1961 seems to be approximately the same as 1957. This low production in 1961 from the limited amount of data now available seems to be primarily due to higher than normal temperatures during part of February and through the month of March and then a drop well below the 5-year average in the month of April. Somewhat the same situation occurred during 1957 and both years showed Louisiana's lowest shrimp production.

Long range data now being collected at our laboratory will be of great value, not only to Louisiana alone but also to all the states bordering the Gulf of Mexico.

SHELL PLANTING

During the month of June 1960, 71,531 barrels of clam shells were planted in Lake La Fortuna (Caliga Bay) and a 75 to 95 percent spatfall was collected on these shells, most of which were taken by our oyster fishermen during the fall of 1961.

During the month of June 1960, 107,550 barrels of reef shells were planted in the vicinity of Petit Pass Island and Grassy Island in Lake Borgne. Excellent results were obtained from the Petit Pass planting. However, only about 30 percent survived from the Grassy Island planting primarily due to the high river stages in Pearl River. These shells will not be lost, however, as there is presently a new catch of spat on these shells obtained from the 1961 spatfall.

During 1961, 183,642 barrels of clam shells were bedded in the South side of Black Bay (Nigger Lake) in close proximity to our Bay Gardene Seed Ground Reservation where a watchman is stationed at all times and this planting can be easily patrolled so that the small oysters can be harvested for seed when they have attained the proper size.

During May and June of 1961, 86,064 barrels of reef shells were planted in Three Mile Bay and surrounding Little Raccoon Island. A good catch has been obtained on these shells and an excellent seed crop from this planting should be available during the fall of 1962.

SISTER LAKE SEED OYSTER RESERVATION

The policy of opening our seed oyster reservations in alternate years has been very successful as shown by the results obtained. After the closure of Sister Lake in 1959-60 and the opening of this Lake in 1961 the production reached 90,000 barrels from an area of only 600 acres which was available for production. A more detailed report of the Sister Lake oyster management area will be shown in the biological section report.

BAY GARDENE SEED OYSTER RESERVATION

Bay Gardene was closed in 1960 and opened in 1961. The production from this lake jumped from 8,543 barrels of seed oysters in 1959 to 34,900 barrels in 1961.

Results obtained from these two seed oyster reservations clearly show that opening on alternate years is highly beneficial.

OYSTERS AND WATER BOTTOMS BUDGET ELIMINATED

In July of 1961 the budget for the Oysters and Water Bottoms Division was eliminated and all of the operations of this Division are now financed from the specially dedicated Oyster Seed Ground and Commercial Seafood funds. These funds are obtained entirely from royalties received from reef and clam shell operations in this State. It will be noted that funds from this source dropped in 1961 and it is our hope that there will be an increase in shell production in 1962-63 when the Federal and State road work in South Louisiana reaches its peak.

CRAWFISH REPORT

At this point we wish to express the great loss to this Division as well as to the State caused by the death of Percy Viosca, Jr., on August 28, 1961. Mr. Viosca, a great naturalist and scientist, was recognized internationally for his knowledge of shrimp, crabs, crawfish, frogs, snakes, turtles, etc. His entire life was spent studying the fish and shellfish of his native state and his scientific publications will be used often in the years to come. Letters received by this Division from all areas asking for information on the pond raising of crawfish indicate the deep interest of our citizens in this subject.

In our biological report detailed information can be obtained on this subject from excerpts taken from a report of Mr. Viosca. This report will be published in full within a few weeks and will then be available to those interested.

MENHADEN

It is of considerable interest to note the recovery of the menhaden industry from a low of 475,526 units in 1958 to the 1961 figure of 1,117,505 units. 666 pounds or approximately 1,000 fish are considered one unit.

During 1958, 1959 and 1960 heavy foreign imports and small catches seriously hampered this industry. Presently the price has risen somewhat and the large catch in 1961 has greatly improved the financial condition of those engaged in handling menhaden fish meal.

Knowledge gained from past experience would indicate menhaden have never been over fished and invariably come back after lean years.

Shrimp Production (Heads on)

Year	*Bbls.* (210 *lbs. per bbl.*)
1960	306,774
1961	230,190

Fresh Water Fish Production

1959	14,848,022 lbs.
1960	13,936,631 lbs.

Salt Water Fish Production

1959	8,714,648 lbs.
1960	7,745,291 lbs.

Baby Green Turtles (Number)

1959	546,150
1960	394,100

Menhaden Production (Units)

(one unit=666 lbs.-approx. 1000 fish)

1960	907,511
1961	1,117,505

Report of Collections (Fiscal Year)

	1959-60	*1960-61*
Oyster bedding ground rentals	$ 58,196.00	$ 65,581.00
Oyster privilege tax	11,865.15	15,554.55
Oyster tonnage licenses	1,231.50	1,548.25
Oyster dredging licenses	6,900.00	9,700.00
Oyster resale, shop, etc.	1,075.00	1,275.00
Transfer fees	38.00	26.00
Shells	804,237.96	687,414.52
Gravel	6,421.05	....
Sand and fill material	42,715.04	36,945.58
Survey fees	8,047.75	12,383.25

Report of Production (Calendar Year)

Total barrels of oysters taken from Louisiana waters

	1960	*1961*
Terrebonne	76,465.75	90,914.50
Lafourche	61,300.75	60,276.50
Plaquemines	203,959.50	186,674.50
Jefferson	69,371.50	75,671.50
St. Bernard	67,673.75	106,038.25
Cameron	....	3,600.00

Total cubic yards of sand, shells and gravel taken from Louisiana waters

	1960	*1961*
Sand	83,432.88	52,950.61
Oyster shells	2,540,383.39	3,196,994.28
Clam shells	3,562,798.67	3,297,591.15
Gravel	24,832.00	....
Fill material	1,097,219.00	2,078,225.00

Marine Biological Section

LYLE S. ST. AMANT
Chief Biologist

A. V. FRIEDRICHS, JR.
Ass't. Chief Biologist

PERCY VIOSCA, JR.*
Marine Biologist

KENNETH C. CORKUM
Marine Biologist

JAMES G. BROOM
Marine Biologist

EMERY HAJDU
Marine Biologist

BARNEY BARRETT
Hydrographer and Geologist

INTRODUCTION

THE MARINE BIOLOGICAL SECTION, with the completion of its new laboratory and an increase in personnel, is rapidly approaching a status of full technical service to the Oysters, Water Bottoms and Seafoods Division of the Wild Life and Fisheries Commission. The manifold problems in the marine environment, however, necessitates that expansion and accomplishments of this service continue until it can be maintained on a par with that of other states and should be at least equivalent to the effort now being placed on inland species.

The importance of marine seafood production and its attendant problems in the northern Gulf ranks first in the United States. To a large extent the key to our knowledge of northern Gulf production lies in the effects of the Mississippi River on the area. Since this valuable and all important esturine area is the source of Louisiana's great seafood production, it should be the aim of our state to be the leader in the field of marine research and applied biology for the area. To obtain this, expansion of facilities and manpower must continue which in time will necessitate budget increases. The net result will eventually furnish protection, improvement, and an understanding of ways and means to maintain our great seafood potential.

Basically the present program of the marine biological section deals principally with the many phases of research needed to maintain our great shrimp and oyster fishery. In addition, work on marine fisheries, crabs, and sport-fishing is contemplated. In general, the type of work being done may be catagorized as follows:

LYLE S. ST. AMANT

1. Longe range investigations: Aimed at bettering seafood production and quality and at alleviating various ills of the industry.
2. Short range studies and field examinations: Designed to furnish some immediate information which may be used by the Wild Life and Fisheries Commission in formulating rules, regulations, and policy concerning marine problems.
3. An extensive research on shrimp is being developed which deals with breeding, growth, movements, and the effects of salinity and temperature.
4. An oyster research program aimed at bettering the state's production and quality of this valuable resource. Much work is planned toward controlling predators and diseases.
5. Direct technical aid to oyster growers: This is an extension type service offered the individual oyster grower. Upon official request, problems on individual oyster leases are studied and reported on.
6. Development and management: Natural state seed grounds and oyster reservations are studied and managed annually to achieve maximum production. Supplemental seed oyster production is accomplished by shell plantings.
7. Cooperative research: Cooperative research is carried on with the food technology laboratory at Louisiana State University and other university and governmental research agencies interested in marine problems.
8. Education: The biological staff and the facilities of the marine laboratory are available and are frequently engaged in various cooperative educational programs with the

---

*Deceased August 28, 1961.

The Marine Research Laboratory located on Grande Terre Island near Grand Isle, Louisiana.

universities, colleges, and high schools of Louisiana. Short courses, field trips and lectures are provided for interested parties upon official request.

9. Water resources and pollution: Continual availability of maximum acreages of unpolluted estuarine areas are a necessity if Louisiana's seafood industry is to survive and increase. The technical staff makes studies, prepares reports and acts in matters of interagency coordination where estuarine problems are concerned. Much work has been done on the New Orleans to Gulf outlet, various other navigation channels and on projects to introduce river water into our excessively saline marsh areas. Studies of industrial pollution and specific pollution problems in oyster areas require approximately 30 percent of work schedule of the present staff.
10. Other activities: Some time is spent in preparing papers and publications to be given at various meetings. The senior biologist is also active on various inter-state and national committees, some of which are (a) Shellfish research committee, Gulf States Marine Fisheries Compact, (b) Estuarine Committee, Gulf States Marine Fisheries Compact, (c) Shrimp research committee, Gulf States Marine Fisheries Compact, (d) Pollution committee, Southeastern Section, American Fisheries Society.

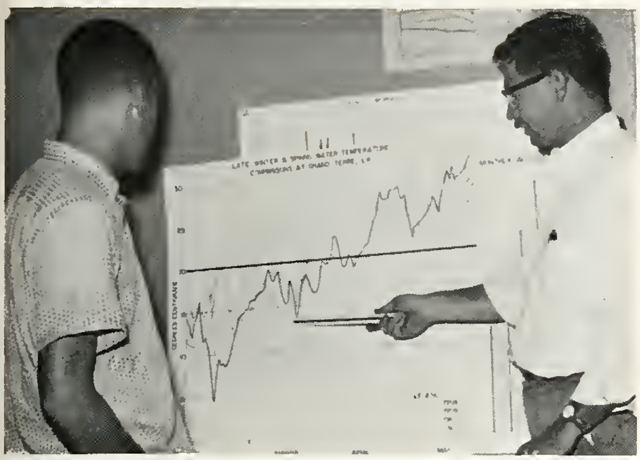
The following report will detail typical examples of the work outlined above and will describe the location and extent of the new laboratory facilities.

RESEARCH HEADQUARTERS AND LABORATORY FACILITIES

The Wild Life and Fisheries Commission's modern and extensive marine laboratory facilities were completed and occupied in August 1960. Since that time, Grand Terre Island, near Grand Isle, Louisiana has become the center and headquarters for most of the state's marine research. At present at the facility is a staff of seven professional biologists or related scientists, three biologist's aides, and eight supporting personnel, whose duties range from boat captains to clerical help. Approximately 60% of the present staff has been added since June, 1961 and it is hoped that the technical personnel will continue to be increased until a minimum of twenty are available for project assignments.

It is felt that Louisiana can be justly proud of its new marine research facility. The interest shown and the use made of the marine laboratory by groups outside the Wild Life and Fisheries Commission, per se, has been most gratifying and serves only to further amplify the long and great need for such a facility on the Louisiana coast. During the short existence of the new laboratory it has functioned as a training and research area for university scientists, high school teachers, college and high school students, and a meeting place for various governmental committees and research scientists concerned with marine work.

The Wild Life Commission's new laboratory is basically well equipped for all types of marine work and adequate funds are available for the continued purchase of additional and specialized equipment as needed.



Geologist and biologist cooperate to combine hydrographic and biological information.

The laboratory has a non-metallic running salt water system, compressed air lines, electricity, vacuum systems, controlled temperature, and continuous recording of principal weather and hydrographic data. Two indoor running water tank rooms are in operation, and a third large area will be available for expansion. Facilities are also provided for outside holding tanks and large experimental projects. Also included is a well equipped chemistry and bacteriology laboratory, a histological technique and miscroscopy laboratory, a complete photographic section including movie and photomicrographic equipment and a walk-in controlled temperature cooler room. Aside from the fundamental laboratory area there are seven additional areas including offices, a library and conference room, and a drafting and cartographic room.

Other facilities include docks, repair shops, several boats, and housing for personnel. The principal need at the marine headquarters now is an expansion of housing for personnel and visiting research scientists. This need will multiply as the staff and the outside interest in the research center grows.

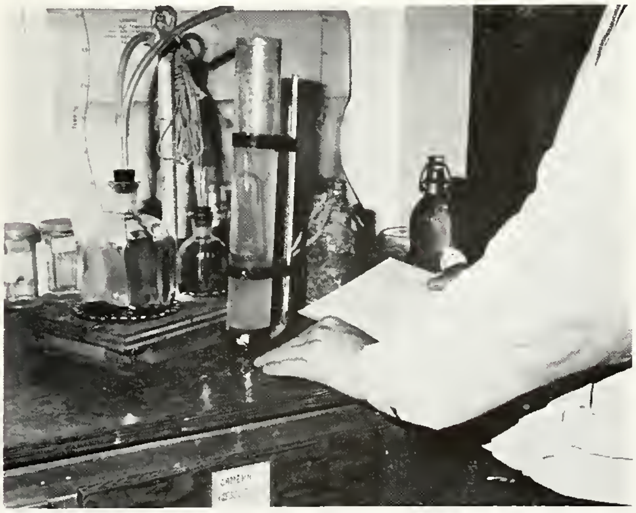
Various sections of the laboratory and the working personnel are shown in photographs throughout this report.

Geologist at Marine Laboratory places recording paper on salinity indicating instrument.

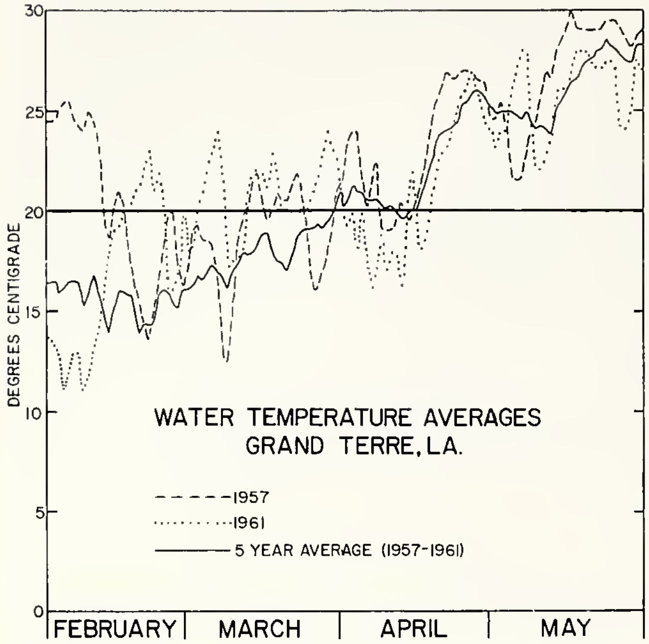
RECENT HYDROGRAPHIC ASPECTS OF THE LOUISIANA COAST

The water temperatures, salinity, gradients, and water movements in Barataria Bay are studied intensively at the Grande Terre Marine Laboratory. It is hoped that such complete data gathering can eventually be applied to many more areas of the Louisiana coast, however, the location of the study area near the central part of the coast does, to a great extent, reflect the general conditions over the entire area. The principal exception to this statement is that those areas nearest the deltas of the Mississippi and Atchafalaya Rivers will have correspondingly lower salinity gradients than those areas farthest away from the deltas. The water temperatures in Barataria Bay reflect rather closely water temperatures over the entire coast.

In order for hydrographic data to be of full value it is necessary that a complete and accurate set of data be available over a long period of time in order that the unusual (extreme) conditions can be identified and compared to average (mean) conditions. With the accomplishment of such data analysis, hydrographic conditions may then be correlated with seafood production: i.e. should production increase or fall below normal there may be hydrographic evidence to indicate a possible cause for the change in production. If such is the case and it can be demonstrated accurately and clearly it follows that continuous hydrographic analysis may be of use in predicting trends in seafood populations. While the data indicated in the following discussion covers only a short term and the trends indicated must be taken with reservation until verified by future data collection and analysis, it should be clear that the hydrographic picture will be an important factor in studying shrimp, oyster, and seafood production.



Instruments used to collect water and determine salinity before electronic recording devices were obtained.



Graph I

Temperature

Water temperature and to a large extent its controlling factor air temperature becomes an important factor when dealing with cold blooded animals such as shrimp, oysters, and fish. The breeding cycles, feeding, growth rates, and activity patterns are largely governed or stimulated by changes in water temperatures. Generally speaking winter temperatures below 20°C* (68°F) reduces or prevents breeding, slows growth (except in oysters), causes reduced activity or initiates migrations of populations to deeper offshore waters. Warm water (above 20°C or 68°F) generally initiates breeding, causes migrations of adults and young to shallow nursery areas, increases feeding and growth.

Average or normal changes of water temperatures in the spring of the year are shown in graph (I). Here a five year average, from 1957-1961 indicates that the winter to summer change occurs near the end of March or in early April as the water temperature rises above 20°C (68°F) and continues upward to high summer temperatures. Two types of deviations from this average trend may be expected and for want of better terminology may be designated as (1) normal or expected cyclic deviations and as (2) abnormal, unexpected, or infrequent deviations. In so called normal or cyclic deviation the slope of the temperature curve would closely parallel that of the average curve on graph I but would move up and across the 20° line earlier in March or even in February in cases of mild winters followed by early spring and summer conditions. In such instances all cold blooded animal activity would probably be advanced by several weeks or even a month. It would also be natural to expect the opposite to occur following severe winters and long cold springs. The temperature slope would drop lower, reach summer conditions later and animal breeding, production, and activity would be delayed by several weeks or longer.

Both types of conditions have been observed in the Barataria Bay region with respect to shrimp activity, and with particular reference to their growth and movements into inside shallow waters.

Cases of abnormal or unexpected deviations have also been recorded for Barataria Bay. In graph (I) it will be seen that in 1961 water temperatures were much higher than normal during part of February and throughout March, only to drop well below the five year average in April. This resulted in a marked change in the normal slope of the temperature curve. To a lesser degree a similiar but earlier occurrence of a winter warm spell followed by rather sharp deviations occurred in 1957. The total significance of such abnormal temperature changes on the normal activities and patterns of animal populations in the area is not yet clear but it is interesting to note that in 1957 and again in 1961 shrimp production was 50% below normal. It remains to be seen whether similar deviations in future years will result in low shrimp production and whether contemplated studies will disclose the mechanics of the effects if such proves to be the case.

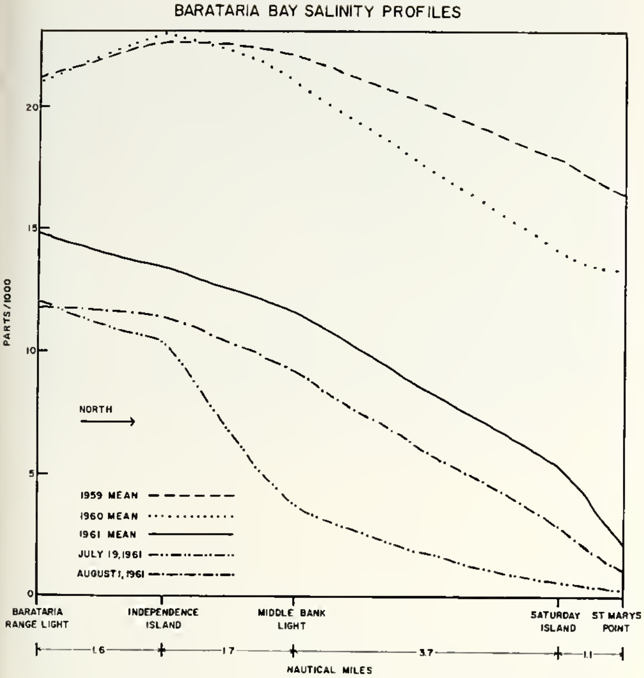
Salinities

In dealing with sea life the salinity or salt content of the waters harboring the various seafood species is an important environmental factor. Some animals thrive only within narrow salinity limits while others move across wide salinity gradients with apparent ease. In esturine areas and particularly along Louisiana's coast, salinities vary widely and may fluctuate from day to day

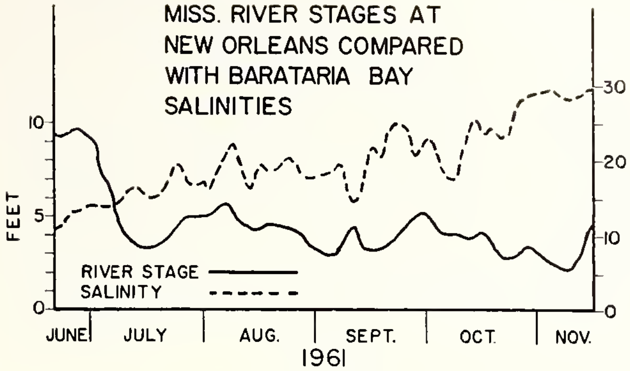
Biologists are shown using instruments to determine amount of sediment that covers water bottoms.

---

*20°C has arbitrarily been set as the critical temperature marking the greatest change in activity in the shallow water areas *based on limited observations to date*. As more data is analyzed and more animals are studied this point may be revised upward or downward by several degrees.



Graph II



Graph III

or from week to week. As more and more data are collected and analyzed, however, certain normal means or trends can be detected and average changes from year to year are noticeable. It is the purpose of this study to attempt to determine what is average in terms of a normal or expected annual condition and what is considered optimum for the best production of the various seafood species. Establishing an accurate and reliable salinity gradient concept for the coast may take years of study, on the other hand, limited available data do show interesting trends and are usable in determining what might be considered extreme or unusual conditions.

In graph (II) based only on recent data, there are several obvious and expected trends. These may be listed as follows:

1. A gradient from high saline conditions to low saline conditions occurs from the Gulf extending inward across the inshore waters to land regardless of whether mean salinities are high or low. Compare 1959, 60, 61 means.
2. As data are taken more frequently, sharp deviations from the mean may be detected. Compare August 1961, July 1961, and 1961 mean.
3. Even though a paucity of data prevents the establishment of long term means, the difference between high years 1959 and 1960 and the low period in 1961 of some 10 to 12 parts per thousand is of considerable significance even when considering animals that adapt readily to wide salinity gradients. Certainly one level would be expected to be a more optimum condition for shrimp, as an example, than the other. Furthermore, when changes as great as those which occurred in July, 1961 are evident an unusual or abnormal condition has occurred.

It is evident that accurate and continuous salinity data are and will increase in value as a tool in predicting or evaluating the effect of this environmental factor on valuable seafood species. It is already evident that the low salinities of 1961 have reduced the oyster drill populations, its breeding activities, and its predation on oysters. Oyster seed grounds and oyster setting were markedly affected with new areas becoming productive and old areas being reduced in production. The effects on shrimp is less clear but several trends were noted. Both 1957 and 1961, low shrimp production years, were years of low salinity, particularly at the time of post-larval migration into the nursery areas and during the growing period of the juveniles. Secondly, shrimp sampling indicated that there was a great dearth of shrimp in the areas of extreme low salinity (below 5 parts per thousand) with some evidence of better or more dense populations in areas of higher salinities.

The factors controlling salinity gradients on the Louisiana coast are river stages and local as well as nation wide rainfall. The outflow of the Mississippi and Atchafalaya Rivers affect the salinity over wide areas around the delta. Graph III indicates that as river stages rise the salinity tends to fall. Such changes are the result of rainfall and snows over much of the central United States. Local rainfall largely affects smaller river systems such as the Pearl River, rivers entering Lake Pontchartrain, the Mermentau and the Calcasieu River systems. Local rainfall may reinforce high Mississippi-Atchafalaya stages as in 1961 to drive the coastal salinities to abnormal low conditions or local droughts may reinforce nation wide low rainfall years to cause salinities to soar. On the other hand, local conditions may tend to counteract Mississippi valley conditions. It becomes clear that a large volume and variety of data must be collected and analyzed if we are to establish predictable trends of this important environmental factor.

Other Factors

It is increasingly evident that other factors will also play a vital part in evaluating the overall hydrographic picture-currents, lunar tides, wind tides, wind direction and velocity, rainfall, drainage, patterns, and the constant natural and man-made changes occurring in Louisiana's coastal area must be studied and correlated with temperatures and salinities. Data are being evaluated and analyzed for all of these factors at the Marine Laboratory.

OYSTER CONDITIONS IN 1961

Weatherwise and hydrographically, 1961 was a most unusual year. Temperatures were high when they should have been low, and low during months that should have had high temperatures. River stages were high over a long period during the spring and summer. Rainfall was excessive and frequent, resulting in an extremely low salt content in all inside waters which was also evident for several miles offshore. (See Hydrographic Section)

With such unusual conditions existing in 1961, many questions arise concerning current oyster conditions and the impact that such conditions may have on the coming fall and winter harvest. Some of the more important questions involve effects on growth and mortality, setting, conchs and predation, the fungus *Dermacystidium marinum*, and probably most important what can be expected of the fall and winter harvest. Some of these questions are examined in the following discussion.

Expected Effects of 1961 Ecological Conditions on Oysters

Because oysters are sessile and never move, and because a great deal is known about the oyster in relation to environmental conditions, it is possible to predict how the oyster will react to changing environmental conditions. Using such existing knowledge coupled with our regular studies and observations of oysters in Louisiana coastal waters, it is possible to evaluate the effect of the unusual environmental conditions occurring in 1961.

The fecundity of the oyster drill is demonstrated here by the vast number of egg cases deposited by one individual.

The oyster industry in recent years has been concerned with high mortalities. Here a staff member studies tissues from oysters for disease organisms.

Breeding and Setting

Because of colder water conditions in late spring, the peak of the oyster breeding and setting was several weeks later than normal. Indications are that the total effective set was less than normal on the more inside seed areas because of unusually low salinity. Studies of Sister Lake and the shell planting area in Black Bay and the Louisiana marshes indicate a much lighter set. This light set, however, does not preclude the possibility of good fall set, if waters become more salty and good setting should have occurred on the lower (more out-side) seed areas which, in normal years, are too salty for the set to survive predation from oyster drills.

Growth and Mortality

Summer growth on all seed beds and in the shell planting areas was less than normal because of extremely low salinities. Here again, oysters in areas normally too salty for summer survival should have grown well with less mortality as low salinities moved closer to the Gulf. Slow growth on the inside seed beds during periods of low salinities should have no effect on fall growth and production, if salinities rise to normal during the latter part of the year in the fattening areas.

Some mortalities did occur from excessive fresh water in the upper-most regions of the bays but additional survivals in lower bay areas should compensate in over-all production.

Predation and Disease

Probably the most beneficial effect of the unusual low salinity will be a great reduction in oyster drill population and activity and a reduc-

The laboratory personnel have available the best in precision equipment. Here Dr. Lyle S. St. Amant, chief marine biologist, uses a phase contrast microscope to study organisms affecting oysters from the Louisiana coast.

One of the operations of the Marine Laboratory is to regulate the planting of clam shells to provide a substrate upon which young oysters can set.

tion in mortalities resulting from the fungus *Dermacystidium marinum.* Summer salinities were so low in the northern half of Barataria Bay that it is improbable that many oyster drills survived. In the low part of the bay, even into the Gulf, salinities fell below 14 parts per thousand for extended periods which reduced drill activity, curtailed their breeding, and possibly reduced the over-all population. Seed and fattening oysters in the lower bay areas should have far less oyster drill predation in the 1961-62 season.

In conclusion it can be said that if fall and winter conditions return to normal and afford good fattening growth of planted seed, and if the set in 1961 is not too light to furnish adequate seed in 1962, then 1961 can be looked upon as generally beneficial to the oyster industry.

THE CULTCH PLANTING PROGRAM

The planting of clam shells and reef oyster shells for cultch to serve as a substrate for oyster spat to set upon has been developed to a high degree through the research efforts and field applications carried out by the marine biological section. The method used and expected results were described in detail in the EIGHTH BIENNIAL REPORT (1958-59). This procedure has developed into an annual management project which utilized most of the technical and supporting personnel during the months of May and June.

In 1960 and in 1961 approximately 300,000 bbls. of shells were planted per year. Two areas were planted each year. In the Petit Pass-Raccoon Island area, approximately 100,000 bbls. were planted annually, while in the Black Bay-Lake Fortuna area some 200,000 bbls. were planted yearly. In the former area, dredged reef oysters were planted both years while in the latter case, reef shells were planted in Lake Fortuna in 1960 and clam shells in Black Bay in 1961.

The general results have continued successful

Laboratory personnel check clam shells for proper size during shell planting operation.

Staff members maintain a rigid inspection to insure the procurement of the proper amount and type of shells used for oyster cultch.

with a 75% to 95% catch occurring on all plantings through 1960. As would be supposed, however, the percent of catch can be expected to drop in some years when uncontrollable, adverse weather and hydrographic conditions happen to occur during the oyster breeding season. In 1961 such unusual conditions did occur (see hydrographic section). Unusually cold water and very low salinities throughout the oyster breeding season resulted in a low spat fall in inside areas where the shells were planted. On outside more salty areas, spat fall was exceedingly heavy. The net result is that the initial set on planted cultch was low, averaging about 30% and ranging up to 70% in some areas. While this initial set is well below the expected average over the past five years, the excellent conditions of the shells makes it probable that a fall set will overcome the early deficit and production of seed in 1962 will be normal. The final answer, however, will not be known until September 1962.

In conclusion it is now established that cultch planting as practiced in Louisiana is a profitable and sound management practice and it is expected that annual plantings at the rate of from 300,000 to 500,000 bbls. will continue on an annual basis. It is also suggested that this program be expanded to new areas in an effort to increase the total oyster production of the state to meet market demands created by oyster mortalities on the eastern seaboard.

BIOLOGICAL SERVICES TO INDIVIDUAL OYSTER GROWERS

During the Biennium of 1960-61 a considerable portion of the work done by our oyster biologists has been allocated to direct services or extension type work with the individual oyster grower. As pointed out in past reports this service involves several types of aid but generally falls into two catagories. (1) Cases where we advised or directed oyster growers how to plant shells for cultch, select oyster areas and/or how to handle their oyster crop for best production results. (2) Cases where damages to oyster beds or loss of oysters has occurred in which instant studies of the individual problems are made and then reported on in an effort to aid the oyster grower to secure proper redress for damages.

In the latter case complaints made by oystermen must be direct and individual requests are necessary before technicians are assigned to the study. It is also suggested that oystermen make complaints as soon after damage occurs as possible. A delay in examination results in a loss of evidence and an unclear understanding of the total damages.

A study of the types of damage and the number of cases in each catagory reflects to a great extent the phases of industrial expansion which results in damage or pollution to oyster areas. Such data aids in direction of the emphasis of the waste control section and helps in establishing policies and regulations for the control of industrial damage to coastal nursery grounds and oyster areas.

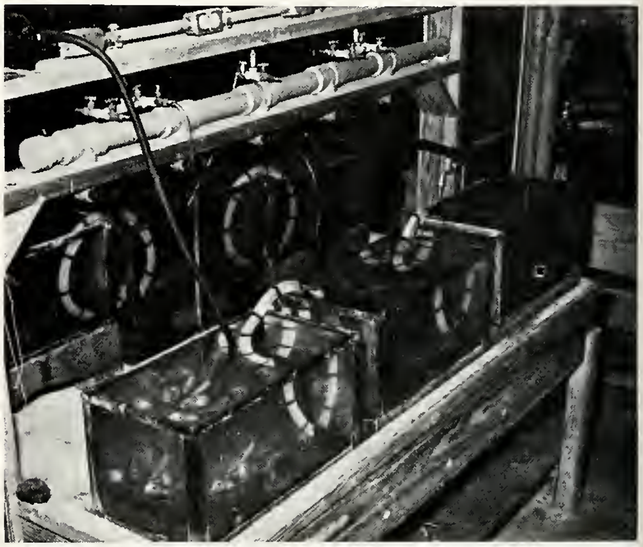
Table (I) compares the summaries of all types of complaints and examinations during the last three biennia.

Table I

TYPES OF COMPLAINTS

	1956-57		1958-59		1960-61	
Types of Damages	*No.*	*%*	*No.*	*%*	*No.*	*%*
Seismic Operations........	8	13.3	2	4.5	0	0.0
Silting & dredging.........	25	41.6	25	56.8	36	56.2
Oily taste in oysters.......	9	15.0	6	13.6	8	12.5
Ecological changes	4	6.6	3	6.8	0	0.0
Exam. prior to dredging...	5	8.3	1	2.3	2	3.1
Marsh buggy damages.....	3	4.0	1	2.3	3	4.6
Oyster diseases & predation.	1	1.7	0	0.0	1	1.5
Unknown causes	5	8.3	1	2.3	4	6.2
No damage found	0	0.0	2	4.5	0	0.0
Tug & barge damage......	0	0.0	3	6.8	10	15.6
Total	60	99.8	42	99.9	64	99.7

It is evident from table (I) then that the downward trend of all types of damages seen in the 1958-59 biennium has reversed itself and has increased to a total of 64 cases the highest number recorded since 1956. A closer examination of the table will show that the increase is principally due to a great increase in the total number of silting, dredging, tug and barge damage cases. In 1956-57 and 1958-59 these types of cases totaled 25 and 28 respectively while in 1960-61 an increase to 46 cases is noted or nearly double that of past years. The cause of such an increase can only be attributed to an increase in industrial activity and expansion in the coastal area. Probably the most pertinent activity has been the laying of new pipelines and the in-



Oyster drills are held in salt-water aquaria in the laboratory to study their life history and predatory habits.

creased boat and barge traffic attendant to industrial activity. Although an increase in the total number of damage cases is regrettable and efforts are being made to reduce such damage, the effectiveness of certain phases of pollution or damage control is reflected in table (I). For example, seismic damage has gradually decreased and none was reported in 1960-61. This decline is at least in part due to cooperativeness by seismic operators and educational efforts on the part of the Wild Life Commission. The number of cases of oil pollution and oily taste in oysters has decreased slightly percentage wise which indicates that good control has been effected in this area except for accidents or human carelessness.

In conclusion, as we have stated many times before, it is clear that the total amount of pollution and industrial damage to the seafood industry is extremely small when the great amount of industrial operation in the coastal area is considered. It reflects the good faith and cooperation of industry in controlling pollution to a minimum as well as the efficient functioning of the States pollution laws and enforcement agency. Experience has taught us, however, that the damages which do occur are a result of carelessness or claimed ignorance of the waste control rules by occasional operators, many of which are contract operators not under the complete control of the major companies. It is our opinion that there is no excuse for such flouting of laws or carelessness and we would strongly recommend that major industries impress upon all contractual services and attendant industries the need for complying with pollution prevention and abatement rules.

SISTER LAKE

Introduction

Sister Lake has been under continuous observation and has had periodic intensive studies made of it by the present technical staff since 1954. After five years enough data was on hand to make specific recommendations for managing the lake on an experimental basis. These recommendations were made along with a detailed report to the Commission in 1959 and were also published in the last biennial report. On the strength of these data the Commission allowed us to place Sister Lake on a trial management plan starting in January 1961 with the closure of the lake. The experiment was to continue until such time as definite results could be assessed. This report discusses the result of the work to date.

Background and Nature of Experiment

Prior to 1958, Sister Lake had been dredged at random whenever it could be demonstrated that enough oysters were in the lake to warrant such operation. The lake had been opened at various times in nearly every month from September to April. The length of dredging at any given time varied from a few weeks to several months and was usually controlled by the law of diminishing return. A low point in production was reached in the fall of 1957 and the spring of 1958, when an estimated 4,000 barrels of oysters were in the lake and it was recommended that the lake not be opened. After skipping this season it was opened in the fall and winter of 1958-59 and production jumped to 20,000 barrels.

Oyster drills shown feeding on an oyster removed from its shell. The proboscis of each snail is extended under the glass plate.

After examining the data from Sister Lake and other results from Black Bay in connection with our successful shell planting, several facts became obvious. These are as follows:

1. In areas of relatively low salinity it requires approximately 18 months to grow good, large seed oysters.
2. Dredging annually keeps the reefs at a minimum production. Such frequent dredging will furnish a satisfactory amount of seed only as long as all other factors are favorable. A bad set or weather may cause production to fall below that needed.
3. On the other hand, closure of Black Bay and Sister Lake on different occasions indicate that maximum production of a higher quality of seed or steam oysters can be attained in 18 months to 2 years.
4. Dredging later in the spring facilitates a better set because the shells are cleaned and washed just before the dredging season.
5. Once a population has been established it is advisable to harvest all that can be taken since 2 year old and older oysters are subject to severe mortalities from *D. marinum.*

In setting up a plan for Sister Lake it was recommended that (1) the lake be dredged only on alternate years. (2) that dredging continue as late as possible into the spring so that the shells would be clean for setting. And (3) that as many oysters as possible be taken from the lake when open. This experiment was to continue through several cycles which would require a minimum of six years.

Results

Thus far, the result of the experimental management of Sister Lake has been gratifying. After closure in 1957 and opening for the 1958-59 season, production jumped from 4,000 to 20,000 barrels. After closure in 1959-60 and opening in 1960-61, production has reached 90,000 barrels. It is not known and cannot be determined for some time what the maximum sustained yield will be. It should be noted, however, that this year is the first time since the experiment began that dredging late in the spring will be accomplished. This should result in a heavier catch and in better yield in the 1962-63 season. The total producing area of Sister Lake, however, is only 600 acres because of salt-water encroachment which allows oyster drills to prevent the remainder of the lake from producing seed oysters. Because of this limited acreage it is doubtful that production will ever attain a level to significantly effect the over all seed production of the State, but our findings here should, when proved out, be applicable to other major seed areas in Louisiana.

Conclusion

It may be concluded that:

1. The experimental management of Sister Lake is successful thus far.
2. Production has increased to at least 90,000 barrels in 1960-61.
3. The experiment should be continued until we are certain of this method of management.
4. Harvest on alternate years should be complete since the older oysters are subject to disease.
5. The time of beginning harvest on alternate years is an economic rather than a technical question. Biologically once the production is established, it makes little difference to the oyster when he goes to market, but the condition of the oyster or the condition of the market, can affect the general economy of the moment. It was assumed at the beginning of the experiment that all dredging operations would occur within the normal frame work of the oyster season from September to May, but technically there is no reason to object to harvest at other times, provided the oysterman is willing to take the risk of moving oysters in hot weather.

One of the functions of the Marine Laboratory is to maintain periodic checks on the microscopic fauna of the esturine waters of the Louisiana coast.

SHRIMP STUDIES

SHRIMP STAINING PROGRAM. It is known that the brown and white shrimp breed in offshore waters and that in early Spring to late Fall, depending on the species, the small larval forms move into the shallow bays and inlets. When these immature shrimp reach the marsh areas, they grow at a prodigious rate, attaining a subadult stage in a matter of a very few months. Subsequently, they return to more saline waters to complete the cycle.

The Marine Laboratory has for the past two years been interested in the patterns of movement of the subadults as they leave the estuaries and enter the sea. It is significant to make a study of this nature since a substantial portion of the Louisiana shrimp fishery depends on these subadults as they appear in the "inside" waters and later of course as they make up the offshore fishery. It is necessary, therefore, to gather information on the shrimp's habits not only from the standpoint of its basic biology but also from that of better management in the future.

To determine the direction and extent of the migration, the Marine Laboratory has participated in a marking program in cooperation with other such efforts in the various Gulf States.

The method of marking involves catching and keeping alive, large quantities of shrimp which are then injected with a non-toxic food dye and are finally released. Shortly after the stain is introduced into the shrimp's body, it becomes concentrated in the gill region and there it can be readily seen for a period of several months. The entire process, from catch to release is accomplished in as brief a time as possible so that not only the distance and direction of movement can be ascertained but also a rough approximation of the rate of travel.

To promote the recovery of stained shrimp, a reward of fifty cents is paid for every shrimp returned provided it is accompanied with information as to where and when it was caught.

PHASE I. 1960. In the early part of July, 1960, over 11,000 shrimp were stained and released in each of the three areas indicated on Map 1. By using dyes of different colors, it was possible to determine the origin of a given shrimp when picked up by a commercial trawler. The results of this first portion of the project were quite satisfactory since 1.8% of the stained shrimp were recovered and returned to the Marine Laboratory. (see Table II) Upon first consideration, the percentage of recovery may appear rather low, however, when the total extent of the migration is reviewed, it becomes clear that even such a small recovery is quite indicative of the overall movement. In one instance, a shrimp stained in Vermilion Bay was recovered off Galveston, Texas, a distance of approximately 150 miles. The remarkable thing is that this great distance was traveled in a little over two months time. Not all of the recoveries were as spectacular but the net results did show a general westward movement which corroborates the findings of other workers.

Table II
STAINED SHRIMP RETURNS—1960

Site of Release	*Site of Recovery*	*Number of Brown Shrimp*	*Total*
I Grand Pass	5 mi. E. of Chandeleur Light	1	1
II Barataria Bay	Barataria Bay	340	...
	Barataria Pass	123	...
	Grand Lake	27	...
	Bell Pass (20-30 fath.)	1	...
	South of Oyster Bayou.	1	492
III Vermilion Bay	Indian Point	2	...
	Fearman	68	...
	Redfish Pass	20	...
	N. W. Trinity Shoals (3-5 fath.)	5	...
	Marsh Island	3	...
	Diamond Reef	3	...
	Pass SW Vermilion Bay	31	...
	Between Cameron and Sabine River (8 fath.)	1	...
	SSE Galveston (14 fath.)	1	134
	Recovery Total	..	627

Total Number of Brown Shrimp Stained....35,400

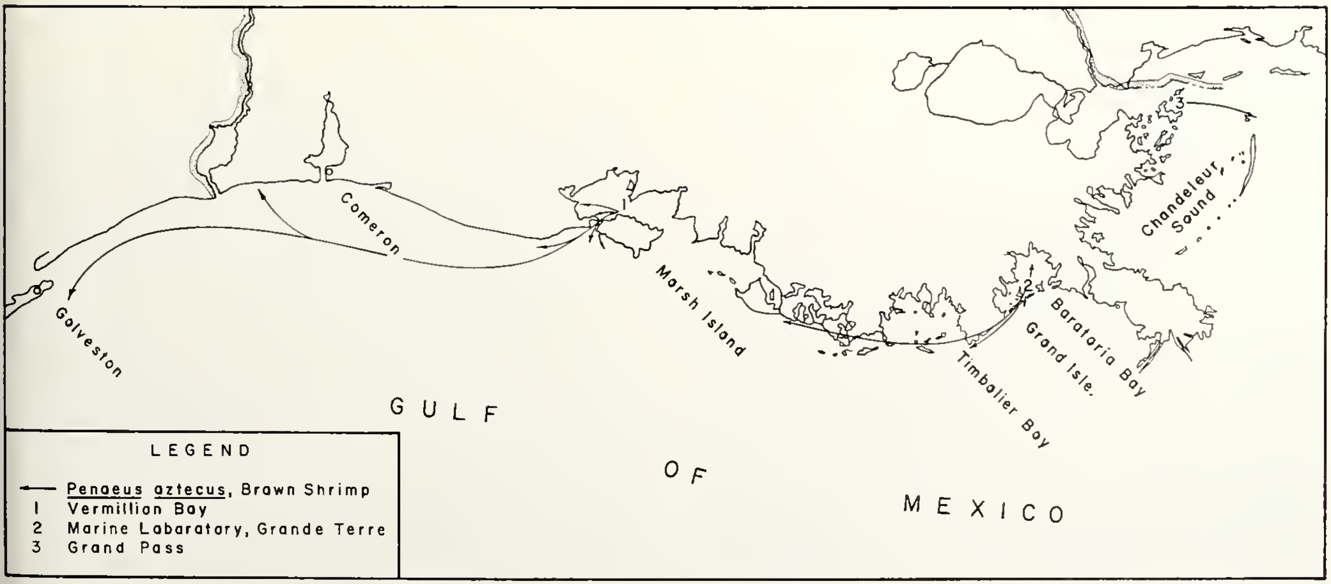
Total % Recovery 1.8%

Part of the low percentage of recovery can be accounted for by the lack of returns from the 11,000 shrimp stained east of the Mississippi River delta. A single shrimp was collected about 30 miles SE of the staining site but none was known to be recovered from the Mississippi or Alabama Coasts. There seems to be little explanation for this except that the shrimp may have been caught by fishermen unfamiliar with the staining program and hence went undetected.

PHASE II, 1961. The staining project was again implemented in 1961. A total of nearly 20,000 shrimp were marked, 15,589 of which were brown and the remainder white. The first portion of this program was carried out at the Marine Laboratory but it was found more expedient to move the entire operation into the marsh west of Barataria Bay. This not only facilitated ease in handling but also cut down on the mortality of the shrimp due to the elimination of transporting the live animals over relatively long distances.

The percentage of recovery in the 1961 experiment was somewhat higher than that of 1960 but from the standpoint of the distances traveled

Map I- MIGRATORY MOVEMENTS OF STAINED SHRIMP, 1960



by the shrimp, the results were less impressive. A total of 5.2% of the white shrimp were returned and 2.2% of the browns were recaptured. (see Table III)

Table III

STAINED SHRIMP RETURNS—1961

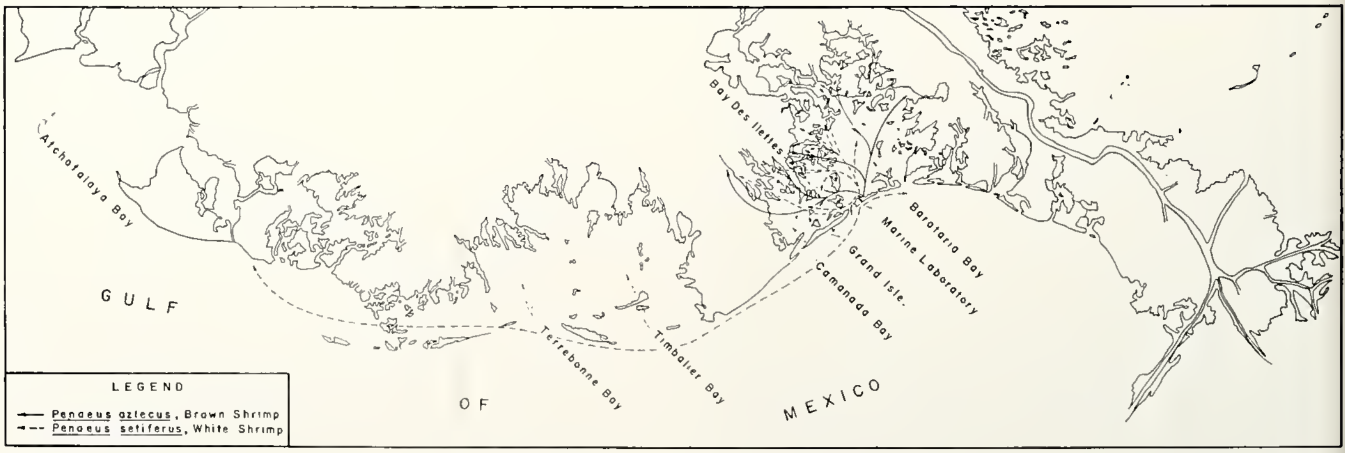
Site of Recovery	*Number of White Shrimp*	*Number of Brown Shrimp*	*Total*
Creole Bay	8	14	22
Bay Castette	45	122	167
Basa Basa Bay	1	.....	1
Hackberry Bay	1	.....	1
Hatchett Lake	40	75	115
Barataria Bay	1	6	7
Barataria Pass	...	12	12
West Champagne Bay	8	53	61
Bay Des Islettes	10	37	47
Bayou Colas	5	.....	5
Oaks Bay	5	1	6
Bay Cajou	9	3	12
Bay du Chene	5	.....	5
Bay Batiste	...	9	9
Bayou Ferblanc	1	10	11
Mud Lake	2	3	5
Grand Lake	2	.....	2
South of Oyster Bayou (3 fath.)	1	.....	1
SSE Quartre Bayous Pass (5 fath.)	1	.....	1
Recovery Totals	145	345	490
Number of Shrimp Stained	2,744	15,589	18,333
Percent of White Recovered	5.2%	.....	.....
Percent of Brown Recovered	...	2.2%	.....
Total Percent Recovered	...	.....	2.6%

Several interesting features were noted during the 1961 experiment which tend to reflect the abnormality of that year's harvest. The lack of both brown and white shrimp of a size suitable for staining was so acute that it was necessary to delay the operation until the early part of August. The paucity of shrimp in and around Barataria Bay was typical of the entire Louisiana Coast and was not merely a local phenomenon. Although a complete explanation for the lack of shrimp during what is usually a peak season can not be given at this time, there are several factors that suggest an answer. When hydrographic and climatic data for the past few years is compared with the corresponding shrimp production, a direct relationship is indicated. It is necessary, however, that more evidence be collected before a definite analysis can be made.

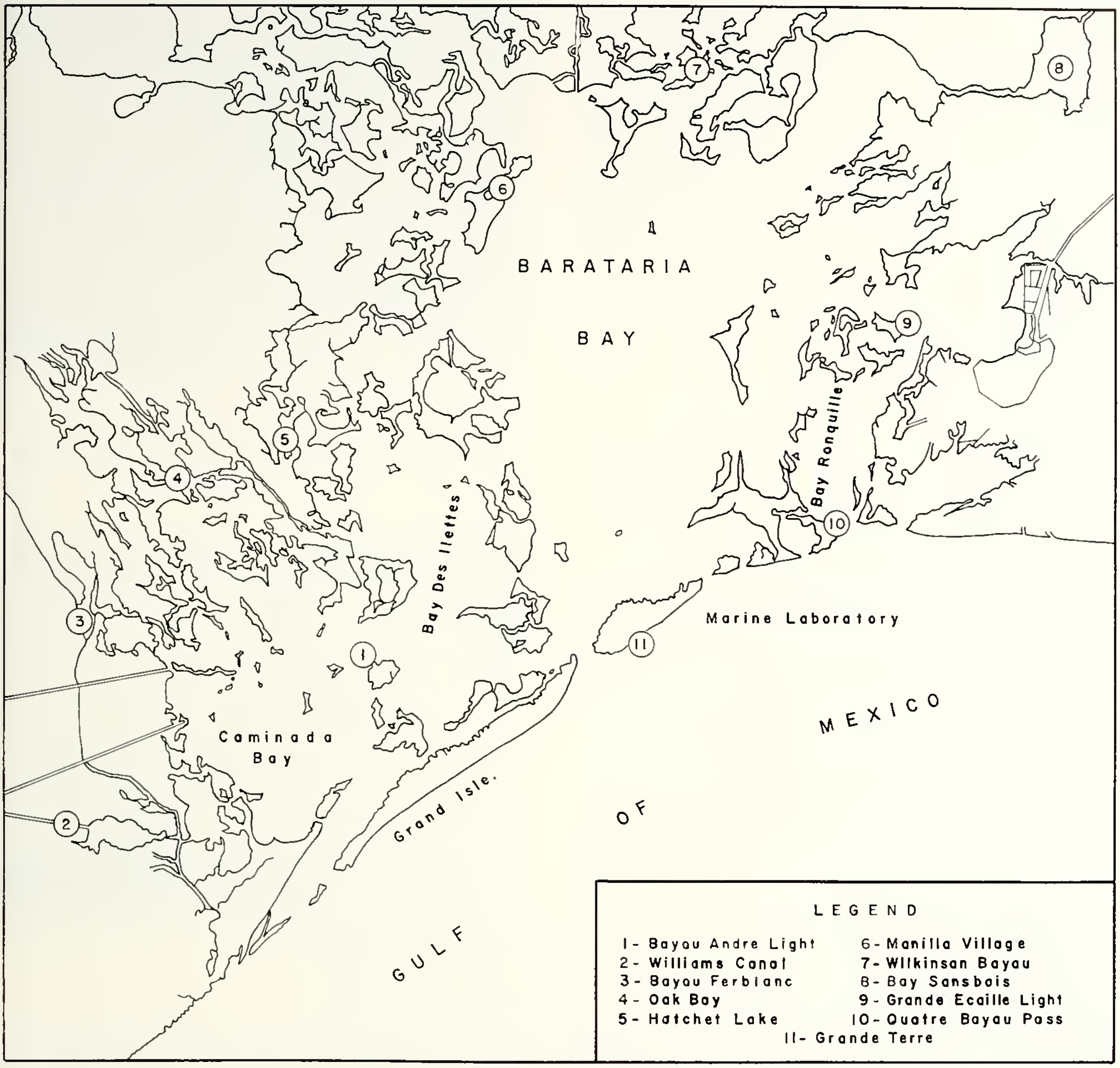
Another notable feature in 1961 was the areas from which the stained shrimp were recovered. (see Map II) It will be noted that not a single brown shrimp was recaptured outside the environs of Barataria Bay. Hence, it appeared that the brown shrimp remained within a radius of approximately five miles of the staining site. This apparent lack of movement cannot be accounted for by the rapidity with which they were picked up by the shrimpers since the staining operation and release was completed well in advance of the opening of the fishing season. Thus, the shrimp had ample time to move unmolested. Too, when compared to 1960, there was a decided difference in the shrimp's reaction. In that year, the program was terminated after the season had been opened and yet the activities of the shrimpers did not, to any noticeable degree, hinder the migration since marked shrimp were caught at a considerable distance from the release site.

There would seem to be two possible answers to the unusual behavior of the stained brown shrimp in 1961. First, it may have been that the movement to more saline water did not occur as early as it did in 1960 because of the apparent

Map 2-MIGRATORY MOVEMENTS OF STAINED SHRIMP, 1961



Map 3-SHRIMP SAMPLING STATIONS IN BARATARIA BAY AND ITS ENVIRONS



lag in the season. Hence, shrimp that would have normally been ready to move offshore had not yet reached the full subadult stage. This possibility is bolstered by the observations made during periodic sampling carried out in Barataria Bay. These collections have shown that a decrease in the number of brown shrimp present did not take place until mid-September which is later than what would be expected as based on previous studies.

Secondly, part or all of the group that was stained may represent a residual population that would normally winter in the bay and would thus not show any appreciable movement. Although this is a possibility, it does not seem likely that all of the shrimp involved would be in this category, though some may have been and these were the ones recovered near the release site.

Compared to the brown shrimp, the whites displayed greater movement not only within the bay but also in the coastal waters. It was noted during the staining operation that most of the white shrimp fell into two distinct size ranges; those that were approximately 150 millimeters in total length and those that ranged around 80 millimeters. It is possible that the larger forms were shrimp that had wintered in the bay and that by the time the staining took place, they were ready to move offshore. In contrast, the smaller specimens represented that year's spawning and were thus of a lesser size. That such is the case is further suggested by the size ranges of the shrimp recovered, by the results of studies made of the inshore movements of postlarval shrimp and by subadult samplings made in previous years at the Marine Laboratory. If this assumption is correct, it would agree in part with the interpretation made of some of the white shrimp movements studied along the west coast of Florida. It should be pointed out, however, that in the Florida studies, the time of egress of the winter population was much earlier than August. The general lag in the 1961 season may have accounted for the late departure observed in Louisiana. Furthermore, it is perhaps this sort of variation in the cycle that in the following summer manifests itself in the wave-like appearance of young shrimp in the bays.

It is difficult to reach definite conclusions from these early phases of the staining experiment but it is believed that by continuing this line of research, the Marine Laboratory can contribute a significant amount of information to our knowledge of shrimp biology.

HISTOLOGY OF REPRODUCTIVE ORGANS. Periodic samples of adult shrimp in offshore waters have been taken in an attempt to obtain a complete history of the reproductive cycle. These shrimp are studied microscopically to determine the stage of development of the gonadal tissue and it has been found that in general the cycle agrees with what is known concerning reproduction in the pink shrimp. There is, however, a difference in the time element but that is to be expected since two species are involved which inhabit, and are affected by, different ecological situations.

The purpose of this type of study is not only of a basic biological nature but also one with a view towards proper management. Thus, when it is feasible to anticipate the time of spawning it will also be possible to foresee the peaks in the movements of larvae into the inside waters. The results thus far obtained are of a preliminary nature but will be amplified in the future.

POSTLARVAE. This phase of the shrimp studies was begun in 1961 by M. J. George (see pp. 160) and has been continued and ramified. At the present time, samples are collected from eleven stations in and around Barataria Bay. (see Map 3) The larval shrimp obtained are classified to species and measured as to size and density. It is believed that by keeping a close watch on the movements of these immature forms as they enter the nursery grounds, it will eventually be possible to predict the yield of the following fishing season. Before this can become a tool of shrimp management, however, it is necessary to a accumulate a vast amount of data from which a standard of evaluation can be derived. To meet

The laboratory is presently engaged in various shrimp investigations. One of the facets of this program is to determine population densities and growth rates of shrimp in local esturine waters.

Marine biologist examines some of the shrimp recovered from off-shore waters during the shrimp staining program.

Biologists concerned with shrimp investigations examine catch from trawling samples taken from Barataria Bay and surrounding area.

Shrimp trawl being pulled in by laboratory personnel.

this end, the Marine Laboratory is cooperating with similar programs in progress in other Gulf States.

SUBADULTS. An intensive study of the subadults is in progress to ascertain individual growth rates and population densities in Barataria Bay. Because of the physical problems involved in covering a large area of the coast on a regular basis, it was decided that a concentrated effort in a more limited region would provide more consistent and significant data. Since the rate of growth of small shrimp in the rich nursery grounds of the Louisiana Coast is so rapid, it is mandatory that sample collections be made not only regularly but also frequently. To acquire the desired data, weekly trawl samples are taken at eleven prescribed stations. (see Map 3) These stations were selected on the basis of how well they represent what is considered to be typical of the area and from the standpoint of geographically encircling the open water of the bay. When samples are taken, they are classified as to species content and the sex and size of the specimens. It is thereby possible to obtain an accurate picture of the dynamics of the populations in this region which is doubtless indicative of what occurs in similar situations along the entire coast.

Along with the trawl samples, simultaneous readings of top and bottom salinities and temperatures are recorded at each station. These are plotted to determine any correlation with what is observed in the trawl. It would be premature to make any direct statement as to such relationships but there is enough evidence to indicate a connection, the degree of which, however, remains uncertain.

In conjunction with the project in the bay, a large number of shrimp have been impounded in a tidal pond on Grand Terre Island. These shrimp entered the pond during a period of high water and their presence detected while they were very small. The pond was then sealed off to prevent their departure. Since this provides a very natural habitat for the shrimp and yet one that is somewhat controllable, it presents an ideal study situation. Periodically, shrimp are arbitrarily selected for measurement and sex determination and are then returned to the pond. To date, the results have been excellent and it is believed that in the future they will help to expand and clarify data collected in the field.

Shrimp trawlers head out to sea from the Louisiana Coast.

PRELIMINARY OBSERVATIONS OF THE RECRUITMENT OF POSTLARVAE AND GROWTH OF JUVENILES OF THE BROWN SHRIMP *PENAEUS AZTECUS IVES* IN BARATARIA BAY

By

M. J. George
Central Marine Fisheries Research
Substation Ernakulam, Kerala State,
South India.

Introduction

Although much work on the biology of the penaeid shrimp has been done in Louisiana waters by several, more especially by the veteran biologist Viosca (1953, 1958 a, b, 1959 & 1960) much is yet to be known about the postlarval stages of these shrimps which come into these nursery grounds. The importance of the research on postlarval shrimp in the inside waters to both the biologist and the conservationist cannot be questioned. So a short stay of the author in the Marine Laboratory of Louisiana Wild Life and Fisheries Commission at Grand Terre Island was utilized to make preliminary studies on some of these aspects in the biology of the brown shrimp.

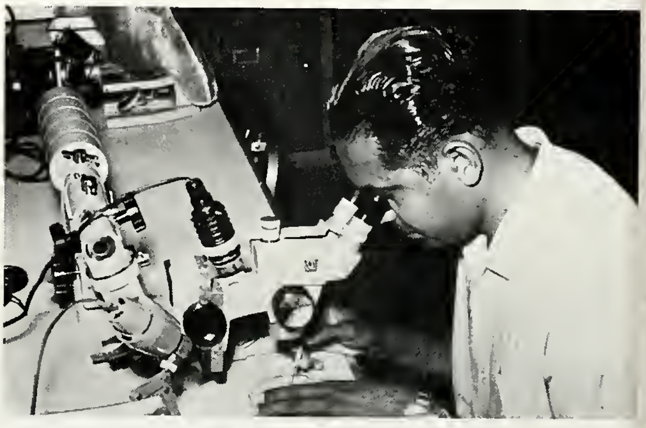
Apart from Pearson's (1939) work, among recent studies the most significant contributions on shrimp postlarvae are those of Williams (1953, 1955 a, b, & 1959) from the waters of North Carolina. Quite recently Bearden (1961) reported on the postlarvae of commercial shrimp from South Carolina. On the growth and other biological aspects of the penaeid shrimp perhaps the most comprehensive contribution of recent years came from Lindner and Anderson (1956) on the white shrimp *Penaeus setiferus*. During the short duration in addition to the studies on postlarvae an attempt was also made to trace the growth of the brown shrimp *Penaeus aztecus* in the nursery waters of the Barataria bay and the results are reported here.

Methods

Collection of surface plankton samples from 6 different stations located in the area of the Barataria bay (fig 1) were made regularly. The stations were established at 1) foreshore opposite the laboratory, 2) inside the bay opposite the laboratory, 3) outside Grand Bank Bayou, 4) in Bay Ronquille opposite Quatre Bayous Pass, 5) in between Bayou Andre and Bay Joyeux and 6) mouth of South West Louisiana canal. The collecting gear consists of (fig 2) a plankton net made in the model of a beam trawl (Renfro 1960) towed behind a boat. The main portion of the net is made up of knitted nylon of 1mm mesh to the distal end of which is attached a smaller net of nylon mesh of 24 strand per cm with the strainer attached to its cod end. The dimensions of the whole net are as follows:

Length of beam	5′
Length of nylon rope bridles from towing rope to beam (2)	5′ . 6″
Length of nylon rope bridles from beam to net —2 on each side	4′
Rectangular mouth of the net (upper edge floated and lower edge weighted)	6′ x 2′
Length of large mesh netting	4′
Length of small mesh netting	2′ . 6″
Diameter at the point where the small netting is attached to the larger mesh	5″
Diameter at the cod end and strainer	2″

The plankton collections were made weekly once from each of the 6 stations and the number of postlarvae in each 10 minute tow were separated and counted. The postlarvae were identified as to species tentatively using the key of Williams (1959). These identifications were later verified by rearing some live ones in the laboratory tanks to easily identifiable stages. Most of these shrimps are still alive in these tanks and they are all clearly identified as *P. aztecus.* At first the plankton collections were made during day time. A few collections were made after dusk from stations 1 and 2 in order to check the difference between day and night collections. No apparent differences were noticed in the first



M. J. George, visiting Indian scientist, studying postlarval shrimp taken from Barataria Bay.

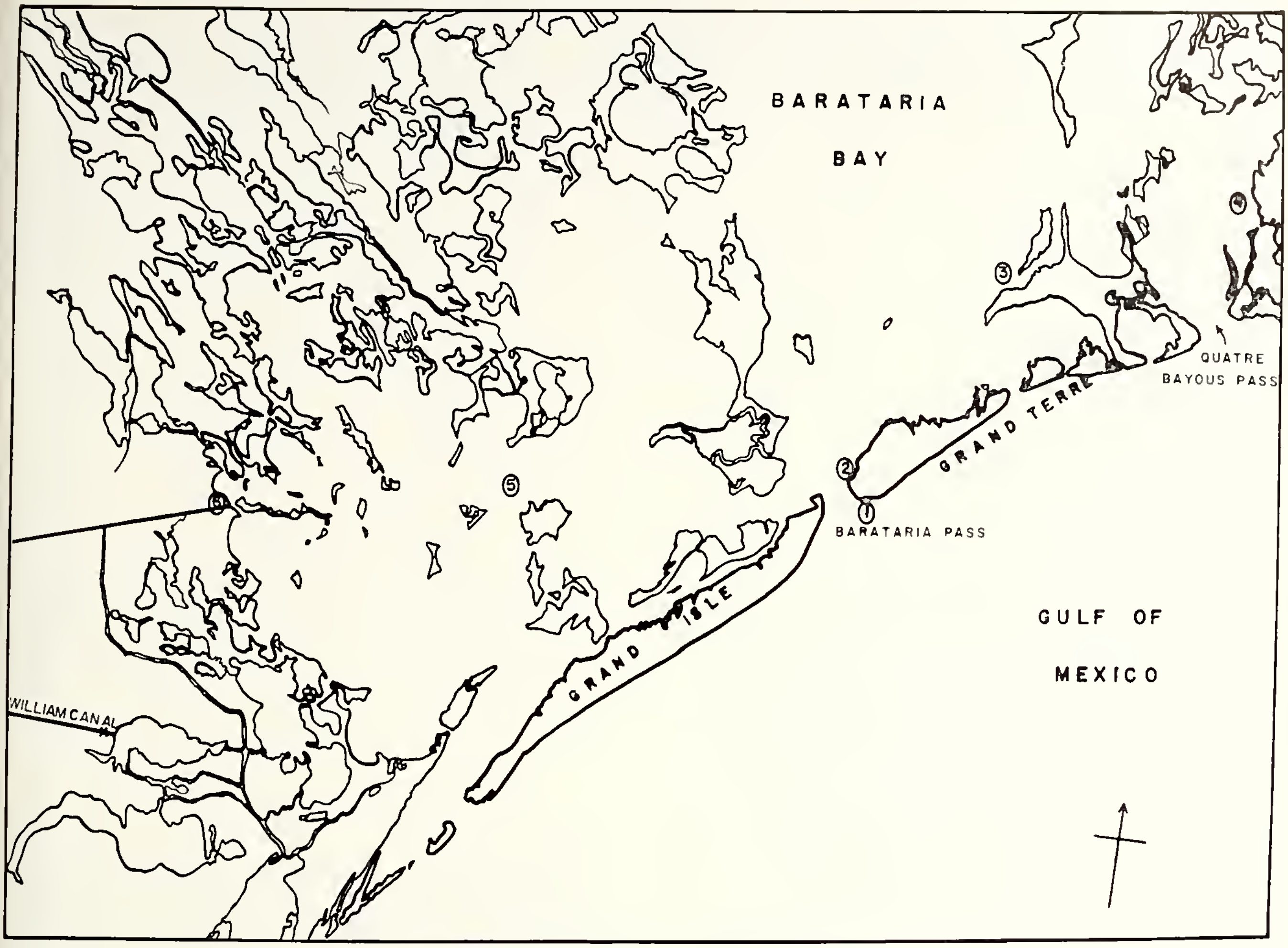


Fig. I. Postlarval Sampling Stations

few weeks. But by the end of May with probably the increase in the water temperature during day time the day collections appeared poor in comparison with the night collections. So from that time onwards the collections were made early in the morning before sunrise.

Juvenile shrimp samples were collected regularly from a particular station in the William canal opening into Lake Palourde on the western side of the bay (fig 1). The collections were made with a small shrimp try net 6 feet in length with 10″ by 14″ board. The weekly samples were sexed and measured.

Postlarvae

Due to the short duration of the author's stay at the laboratory the collection of samples could be carried out only for 2 months. It was commenced by the third week of April and continued regularly upto the middle of June. The numbers and size of the postlarvae found in the weekly samples are given in table 1.

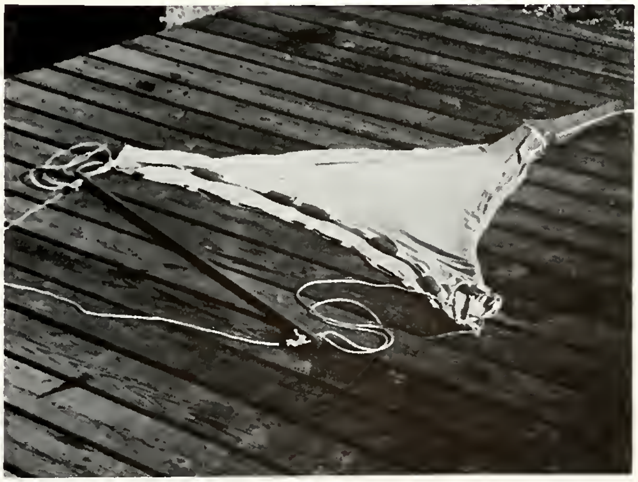


Fig. 2. Plankton net used in collecting postlarvae.

Table 1

SHOWING THE NUMBER AND SIZE OF POSTLARVAE OF *P. AZTECUS* IN SURFACE PLANKTON SAMPLES FROM 6 DIFFERENT STATIONS IN BARATARIA BAY

	Station #1		*#2*		*#3*		*#4*		*#5*		*#6*	
Date	*No.*	*Length**	*No.*	*Length*	*No.*	*Length*	*No.*	*Length*	*No.*	*Length*	*No.*	*Length*
April 20	22	2.7–3.3	3	3.0–3.3	6	2.7–3.3	192	2.7–3.3	27	2.7–3.3	23	2.7–3.3
April 26	28	2.7–3.6	70	2.7–3.6	202	2.7–3.6	315	2.7–3.6	65	2.7–3.6	37	2.7–3.6
May 3	5	3.0–3.3	2	3.0	4	3.0–3.3	3	3.0–3.3	17	2.7–3.6	11	3.0–3.3
May 10	65	2.7–3.6	22	2.7–3.3	5	3.0–3.3	3	3.0–3.3	12	2.7–3.3	1	3.0
May 17	...	...	5	3.0–3.3	...	...	...	...	...	...	...	...
May 24	12	3.0–3.3	15	2.7–3.3	7	2.7–3.0	12	3.0–3.6	3	3.0	1	3.3
May 31	2	3.3	2	3.3	2	3.0	12	3.0–3.3	4	3.0–3.3	3	3.3
June 6	1	3.0	2	3.3	...	...	5	3.0–3.3	...	...	2	3.0
June 13	...	...	1	3.0	2	3.0	10	3.0–3.3	7	3.0–3.3	1	3.3

*Carapace length in mm, from tip of the rostrum to the dorsal posterior edge.

It is evident from the table that the number of postlarvae are at the maximum in the last two weeks of April and thereafter a regular decrease in their number is seen. This indicates a peak of recruitment of the postlarvae of this species into the bay in April. Although data for previous months are lacking some of the preserved plankton samples collected by the laboratory from the bay during the end of January and February which the author had the chance of examining showed a few postlarvae of *P. aztecus* in them indicating recruitment of these taking place in those months also. Although no definite conclusions could be made at the moment without further study it may not be far from the truth to say that the recruitment of these postlarvae starts in late January and continues to June with a peak probably in March-April. It is not possible to specify the end of the recruitment season without continuing the study further. However Williams (1955 a) records more or less the same period of recruitment in North Carolina waters. According to him in the case of *P. aztecus* the recruitment of early juveniles to the annual population takes place from late February to early June with a peak in the first half of May. He mentions a limited recruitment in summer also. Viosca (1959) from Louisiana observes that very small brownies enter inside waters in the early spring and late fall which is quite in agreement with the results of the present study as far as the first half is concerned. From Galveston Renfro (1960) reports a peak abundance of *P. aztecus* postlarvae in March-April. Bearden (1961) records the same recruitment period for these postlarvae in South Carolina as in North Carolina.

Another fact which is evident from the table is that during the peak recruitment period there seem to be more numbers of postlarvae in the samples from the eastern part of the bay, more especially in the samples from the station in Bay Ronquille opposite Quatre Bayous Pass. From this, although premature, it is tempting to conclude that there is more entry of postlarvae into the bay through this pass in comparison to the Barataria Pass, which probably may be due to the current pattern prevailing in the area.

Juvenile growth

The length frequency histograms for the juveniles of *P. aztecus* from April 18 to May 24 is shown in fig 3. It is clearly seen from the figure that the prominent mode shifts regularly from 46-50 mm to 96-100 mm in the case of males and 51-55 mm to 101-105 mm for females, thereby indicating a growth of 50 mm in each case for a period of 36 days. From this the growth rate works out to about 42 mm per month, which is in accordance with the results obtained by others for the penaeids of the Gulf, although Williams (1955 a) records a slightly higher growth of 46.7 mm per month for the same species from North Carolina when the species is actively recruiting, which may probably be due to the fact that he takes into consideration only the upper extremes of the sizes. According to Viosca (1960) the growth rate of *P. aztecus* is approximately the same as that of *P. setiferus* for which he records (1953) a growth of 1 to 1½ inch per month in summer. Williams (1955 a) observed a growth rate of 36 mm per month for *P. setiferus* which agrees with the growth rate deduced by Gunter (1950). According to Lindner and Anderson (1956) the growth for the white shrimp is approximately 40 mm per month.

Continuation of the sampling in the same canal did not show any further shifting in that mode, evidently due to the bigger sizes of about 110 mm and above moving out and the regular recruitment of smaller sizes into the population taking

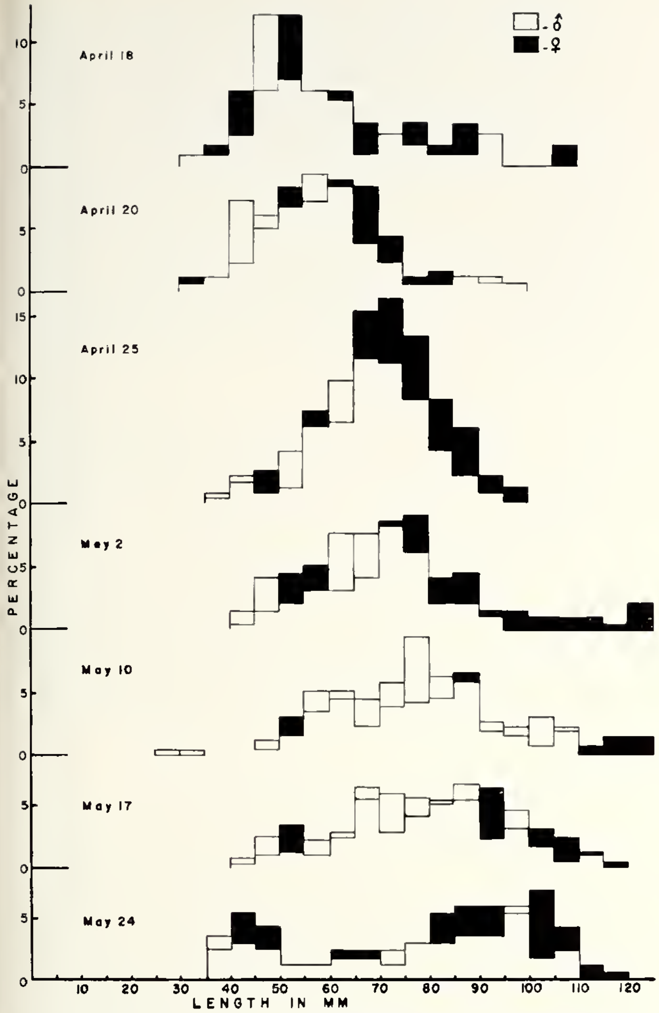


Fig. 3. Length frequency histograms for Juveniles of P. aztecus.

place as may be seen by the secondary modes in the figure.

A differential growth rate between the sexes can also be noticed from the figure, the females maintaining a higher growth rate in all the samples. According to Williams (1955 a)sex differentiation in sizes in *P. aztecus* shows up clearly when the mean total lengths of males and females reached about 100 mm and it increases with advancing age. However it can be seen from fig 3 that this differential growth in sexes is prominent from quite early stages. Author's observations on Indian species of penaeids (*under publication)* also shows this differentiation from quite small sizes. Viosca (1958 b) also records a difference in growth in the sexes, males ceasing to grow at a much smaller size than females.

Summary

The study of the recruitment of postlarvae of penaeid shrimps into the Barataria bay during April to June shows a peak of recruitment of the brown shrimp *P. aztecus* in April. However further study is necessary for confirmation of results. The juveniles of *P. aztecus* are found to have a fast growth rate of 42 mm per month inside the nursery waters of the bay.

Acknowledgements

The author wishes to express his gratitude to Louisiana Wild Life and Fisheries Commission for giving him all facilities for the work. Thanks are due to Dr. Lyle S. St. Amant, Director, Dr. Emery Hajdu, Darrell Hatchell and other staff of Grand Terre Marine Laboratory.

References

Bearden, C. M., 1961; Notes on postlarvae of commercial shrimp *(Penaeus)* in South Carolina. Contributions from Bears Bluff Laboratories, 33, 1-8

Gunter, G., 1950; Seasonal population changes and distributions as related to salinity, of certain invertebrates of the Texas coast including the commercial shrimp. Pub. Inst. Mar. Sci. 1 (2) : 7-51

Lindner, M. J. & Anderson, W. A., 1956; Growth, migrations, spawning and size distribution of shrimp *Penaeus setiferus.* Fish. Bull. 106: 553-645

Pearson, J. C., 1939; The early life histories of some American Penaeidae, chiefly the commercial shrimp *Penaeus setiferus* (Linn). Bull. U.S. Bur. Fish. 49 (1950) : 1-73

Renfro, W. C., 1960; Abundance and distribution of penaeid shrimp larvae. Fish. Res. Galveston Biol. Lab. Circular 92: 9-10

Viosca, P., 1953; Observations on the life history and habits of the lake shrimp. Louis. Conserv. 5 (4) : 2-5

Viosca, P., 1958a; What became of the white shrimp? Ibid 10 (7&8) : 17-18

Viosca, P., 1958b; Seventh Bienn. Report, 1956-1957. Louis. WL & Fish. Comm. pp 96-106

Viosca, P., 1959; Shrimp come back. Louis. Conserv. 11 (2) : 2-4

Viosca, P., 1960; Eighth Bienn. Report, 1958-1959. Louis. WL & Fish. Comm. pp 135-142

Williams, A. B., 1953; Identification of juvenile shrimp (Penaeidae) in North Carolina. J. Elisha Mitchell Sci. Soc. 69 (2) : 156-160

Williams, A. B., 1955a; A contribution to the life histories of the commercial shrimps (Penaeidae) in North Carolina Bull. Mar. Sci. Gulf Carib. 5 (2) : 116-146

Williams, A. B., 1955b; A survey of North Carolina shrimp nursery grounds. J. Elisha Mitchell Sci. Soc. 71 (2) : 200-207

Williams, A. B., 1959; Spotted and brown shrimp postlarvae in North Carolina. Bull. Mar. Sci. Gulf Carib. 9 (3) : 281-290

COOPERATIVE EDUCATIONAL PROGRAM

With the completion of the new Marine Laboratory many scientific groups including Universities, Colleges, High Schools, and Civic groups have been interested in visiting or studying at the new facility. Because of the great demand and interest in the Laboratory a cooperative educational program was set up in 1960 and continued in 1961. The program in general falls into several categories as follows:

1. Visiting professional researchers who are furnished working space and equipment in order to carry out independent research.
2. Visiting University and College science classes actively working in marine biology or geology. Such groups are generally under the direction of their professors and the laboratory furnishes guided field collecting trips, lectures, visual education, and demonstrations of current research or local animals. Such trips are short term, one or two day events.
3. Visits from High School science classes and science clubs. These, like University classes are under the direction of their teachers. Laboratory personnel furnish the same program for High School groups as for University classes except the detail and complexity of the information offered is adjusted to the age level and experience of the group. In all cases, preference is given those High School classes whose teacher has previously attended an organized short course in marine biology at this or other laboratories.
4. A six day short course in marine biology is offered annually in August for qualifying High School teachers. This course is in cooperation with the science section of the Louisiana Dept. of Education. Program planning is jointly arranged by laboratory and Dept. of Education personnel and the participating teachers are selected by the Education Dept. The basic plan of the course not only includes intensive instruction to the High School teacher group but includes subsequent visits to the laboratory by the individual teachers and their classes. All interested parties should make inquiries and applications to Mr. Joseph Gloriosa, Science Section, State Department of Education, Baton Rouge, La. In conclusion it should be pointed out that some 14 groups including a teachers short course was handled in 1960 and eighteen groups including a short course visited the area in 1961. Such are not casual visitors and require organization and effort to make such professional visits educational in nature. For that reason it is not expected that more than 20 groups per year can be handled without considerable increase in staff personnel. In view of this situation it is obvious that all requests for such visits must be made well in advance of an anticipated trip.

COOPERATIVE RESEARCH

Since 1955 the technical staff of the marine laboratory has actively cooperated in research on oysters and shrimp with the Biochemical and Food Technology section of the Louisiana State University Chemistry Department. This research carried out by Dr. E. A. Fieger and his associates has produced valuable information concerning the basic chemistry, food value and preservation of oysters and shrimp.

In 1958 one joint paper was published and at present a joint research effort using radioactive isotopes as tracers of oil in oysters is in progress. It is expected that most of this work will be completed early in 1962.

In addition to a close cooperative arrangement with the Louisiana State University group, Dr. Al Smalley of Tulane University has been using the laboratory research facilities for much of his field work. It is hoped that interest in cooperative research efforts will continue and expand.

CRAWFISH STUDIES

Shortly before his death, the late Percy Viosca, Jr., compiled several years work on the crawfishes found in Louisiana. This compilation is presently in the process of being printed for distribution to interested parties throughout the United States and especially in Louisiana. The following is taken from Mr. Viosca's paper.

There are 23 known species of crawfish found in Louisiana, though only two are of commercial value. They are the red swamp crawfish, (*Procambarus clarkii*), and the white river crawfish, (*P. blandingii acutus*). These crawfish mate in the spring and the female carries the sperm until fall. At this time, the eggs are fertilized and deposited on the ventral position of the females abdomen. The two to four hundred eggs from one female take about 14 days to hatch. The young remain with the female from 2 to 4 weeks and then drop off, a few at a time, to forage for themselves. Most of the adult males and many of the adult females "migrate" and die in the fall, usually during heavy rains. Consequently, there is a very small number of adults that survive more than one year. The young grow slowly through the late fall and winter, but with the advent of warming waters in the early spring they begin to grow at a rapid rate. In April and May, of the following year the young crawfish become sexually mature and ready to mate.

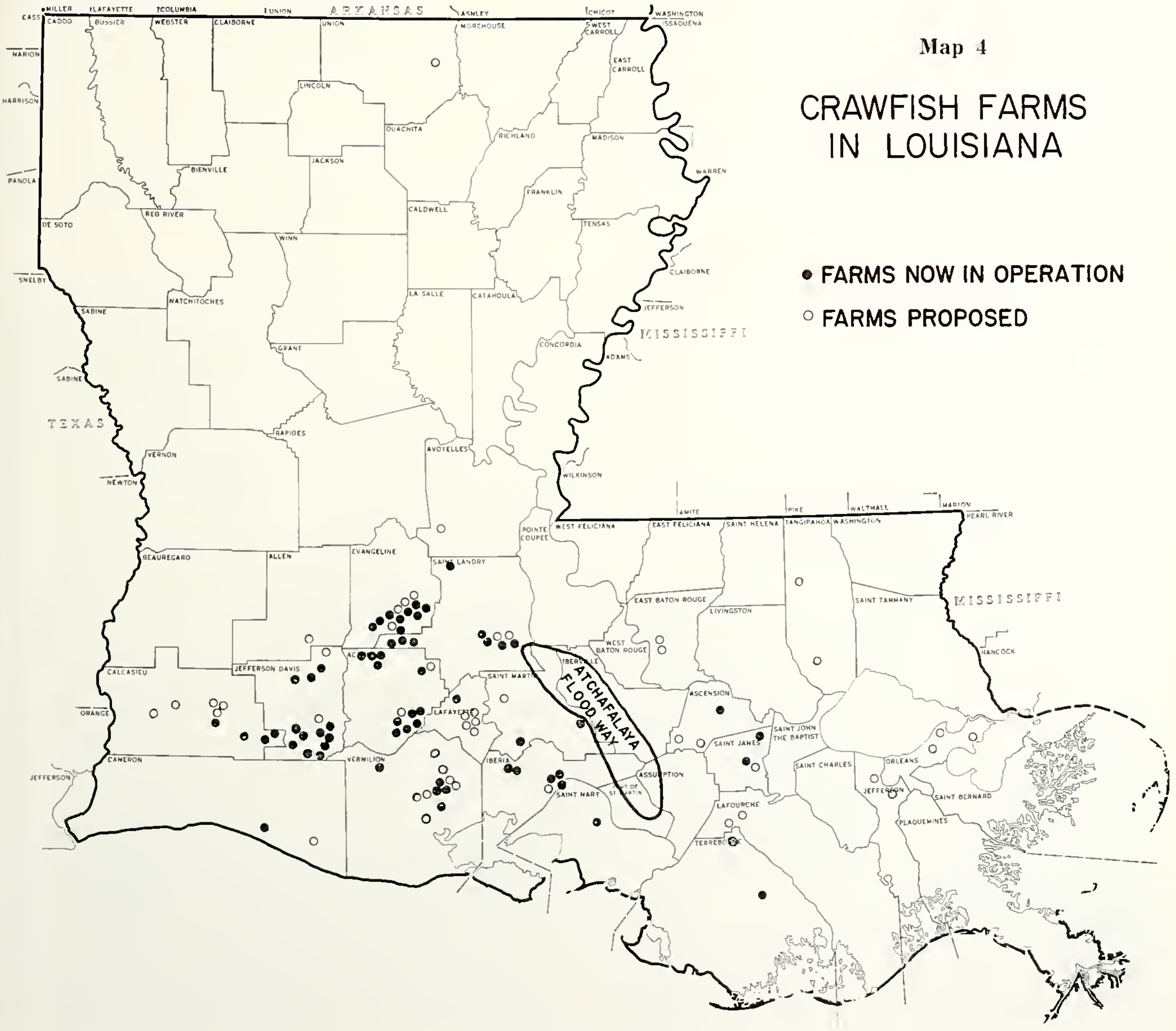
Crawfish farming has become an important industry in the southern portion of Louisiana. At present, there are 63 producing farms and 47 farms planned for the near future. These farms are found throughout the southern portion of the State (Map 4) and in various environmental habitats. The farms are in river flood plains, the prairie country of the south-west, drained wooded swamps and in reclaimed marshland. In many instances crawfish is the only crop produced, but in others there are supplementary products. Some farmers harvest bullfrogs and turtles as well as crawfish from their land; others grow crawfish in ricefields and thus have two crops. In some parts of the state, land was managed to attract waterfowl for hunting and an excellent crawfish crop developed. In other areas impoundments were made to float out timber and the flooded area was found to contain large numbers of crawfish.

The importance of crawfish farms is to a large extent set by the Atchafalaya River. The Atchafalaya River and its flood plain produces naturally a greater amount of crawfish than any other natural body of water in Louisiana. When the crawfishing becomes good in this river area the crawfish are so abundant that the market price drops. This brings an end to the season for the commercial crawfish farmers. Therefore, it is very important for the farmer to harvest his crop of crawfish before the season begins on the river.

As this Commission has been receiving daily requests for information relative to crawfish culture we submit herewith a series of "Hints to Crawfish Farmers." While not the last word on the subject, we hope these hints will provide short cuts to success and enable beginners to avoid some of the pitfalls that might be encountered without some measure of scientific guidance.

Kinds of Crawfish to Rear

The red swamp crawfish (*Procambarus clarkii*) and the white river crawfish (*Procambarus blandingii acutus*) are two large species which have been reared successfully in captivity for commercial markets. Smaller species can be reared for use as bait.



Map 4

CRAWFISH FARMS IN LOUISIANA

Soil Must be Water-Tight

The soil must be capable of holding water at all seasons of the year. Although the impoundments will be dry during the draw-down period (see below), there must be water in the holes which the crawfish dig to protect themselves and their eggs during the summer months.

Water Supply

Any source of water not heavily laden with objectionable minerals is suitable. It can come from wells, lakes, or streams. Some artesian and well waters are too heavily charged with iron, bicarbonate of soda, or other natural chemicals, and these are unsuited to crawfish culture. Common salt (sodium chloride) is not objectionable and in moderate amounts is really beneficial. Water containing lime in the form of calcium bicarbonate is especially desirable, but if not present, lime can be added (see fertilizer).

Location of Intake Pipe

The intake pipe should be placed near the bottom of a lake, bayou, or canal, because bottom water is always richer in fertilizer values, especially usable phosphorus and nitrogen.

Screening of Intake Pipe

All intake pipes must be suitably screened to prevent entry of fish and other aquatic animals which might feed on crawfish or compete for their food supply.

No Overflow Necessary

An overflow is not only unnecessary but actually undersirable, because valuable fertilizer elements can be lost with the escaping water. In pond culture, the only necessity is to replace the water lost by seepage, evaporation, and that used up by trees or other plants whose foliage projects above the water surface (transpiration). A wooded pond requires much more water than one without trees.

Specifications for Levees

Levees with a vertical height of three feet are ample for crawfish culture. The best specifications call for a two-foot crown, a three to one slope on the wet side (pond side), and a two to one slope on the dry side (outer side). Specifications for such a levee will be as follows: height, three feet; crown, two feet; base 17 feet; section, 28.5 square feet; volume of soil per each 100 linear feet, 105.5 cubic yards.

Depth of Water

Generally speaking, the deeper the water, the larger the crawfish will grow before attaining maturity. Two to 2½ feet of water is ample, but crawfish can be reared in water as shallow as six inches. The trouble with shallow water is that it will encourage raccons, ibises (becroche), herons, bullfrogs, and other animals which feed upon crawfish.

Irrigation Period

If water is available, female crawfish will come out of their holes about October 1 to rear and scatter their young. Any delay after that date will delay the early crop the following spring, and this crop is the most valuable. Depending upon pump capacity and area to be irrigated, pumps can be started any time after September 15 so that there will be some water in the ponds by October 1, about the time of the first cool snap.

Adequate Drainage

A crawfish pond must be drained once a year to kill off fish and other natural enemies. During the draw-down period (see next paragraph), the crawfish will dig holes for the protection of themselves, their eggs and/or young. A few small fish will sometimes survive by hiding in the crawfish holes, but the crawfish population will predominate as well as have a head start.

Drawn-Down Period

This period should be planned to accommodate the crawfish which dig their holes and go below ground on or about July 1. This is the best time to drain the water down to mud level, and then it may be allowed to evaporate down to a few inches below the surface of the mud.

Fertilizer

Fertilizer requirements are the same as would be given by the county agent for raising any crop requiring a high calcium fertilizer in the same type of soil, *eg.*, cabbage, cauliflower, brussels sprouts, etc. Divide the fertilizer requirements for the given crop by 180 days (Oct. 1 to April 1st) to get the average daily application per acre of water. Very acid soils (*eg.*, sections of the Florida Parishes) will also require liming with perhaps a ton of lime per acre, but this should last for several years. Broken limestone and basic slag, the pieces being about a half-inch overall, are excellent for maintaining the proper chemical balance in acid soils.

Application of Fertilizer

Fertilizer can be applied in one of several ways, whichever is most economical in a given instance. (1) Daily or weekly applications can be scattered from the shore, taking advantage of the direction of the wind; or (2) the sacks of fertilizer can be placed on small tables or platforms with their top about four inches below the water surface and the sacks cut open so that wave wash will dissolve and scatter the fertilizer over the pond; or (3) the fertilizer can be scattered through the irrigation system by dumping it in the gravel filter box while the pumps are being operated. If applied weekly, use seven times the daily application. Longer than weekly intervals are not recommended.

Vegetation

For the present, we recommend no aquatic plant life other than the algae and underwater growths which come naturally in the water without artificial stocking. During the draw-down period (July 1 to September 1), suitable land grasses and wild legumes will grow; or suitable legumes can be planted over the area. These will die when the water level is raised on September 1, and their tissues will furnish food for the coming crop of young crawfish. This will be supplemented by insect life which grows naturally or falls into the water. When the crawfish crop is alternated with a rice crop, leave the stubble and straw in the fields. This will not only furnish food, but the piles of straw will provide hiding places to protect the young crawfish from predatory birds.

Where to Secure Broodstock

Crawfish broodstock may be obtained from commercial crawfish catchers and from dealers in market crawfish. Henderson, Pierre Part, and Rosedale are prolific sources of wild crawfish. Most of the crawfish farms in southwestern Louisiana will sell broodstock for the initial stocking of new farms. Obtain stock whenever it is available at the lowest market price, which is usually May, June, or early July, when most crawfish will have reached adult stage and get too tough and hard for the markets. Sometimes a source of broodstock develops in summer or early fall when rains or floods drive the animals out of their burrows, and they crawl overland at night. At this season it is only necessary to stock with females, as the eggs are already fertilized and only the new-born babies are really needed. Most of the males will die off anyhow and are only equal to so much fertilizer.

Harvesting

Although harvesting can be done as experience dictates, the early crop always brings the best prices. Standard crawfish nets and traps are the usual methods employed. A recent innovation is the use of floats from which hang lengths of cord which reach bottom. Fish hooks, preferably barbless, (homemade hooks can be made by bending wire) are attached to the bottom ends of the cords and the baits attached to these. The baited floats are placed in rows in the crawfish ponds. The crawfish catchers follow these rows of baits, scooping up each bait in turn with all the crawfish which have gathered around it. The size of the mesh of these scoop nets should be sufficient to permit the escape of all crawfish under acceptable commercial size. Each baited hook with its float is removed from the net and thrown back into the water a little distance to one side, thus forming another row of baits. The crawfish are dumped from the scoop net into bushel baskets, floating tubs, or small boat-like floats.

Oysters, served any style, are truly, "delicacies from Louisiana Waters", and Louisiana oysters are preferred by gourmets the world over. The Wild Life and Fisheries Commission continues to develop new planting and growing methods.

Coastal Waste Control personnel are shown inspecting a pollution gate.

Coastal Waste Control

JACK HOOD

Supervisor

The purpose of the Coastal Waste Control program is to prevent the pollution of Louisiana waters and marshes.

By Legislative Act the enforcement of the Coastal Waste Control program has been designated to the Louisiana Wild Life and Fisheries Commission by the Stream Control Commission.

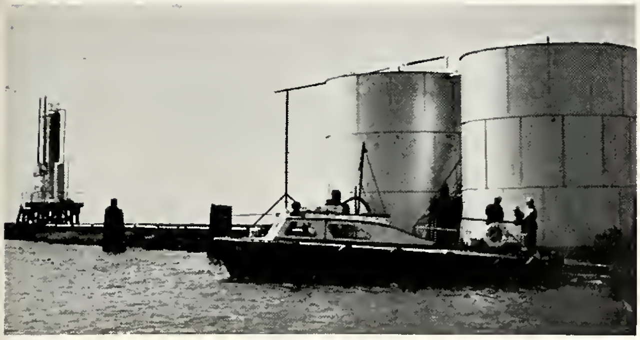
Enforcement functions include routine inspections of all drilling operations, production installations, and transportation facilities of oil, gas, and sulphur. These inspection patrols are made in the southeastern coastal area, including 3 miles offshore, from southwest of Houma east to the Mississippi state line.

Two boat captains and two inspectors utilize two 34 foot speed boats for systemized year-round patrol of their territory. These boats are equipped with two-way radio and depth sounders. By use of the radios, constant communication is maintained with the central office, thus allowing immediate attention to pollution complaints.

Each installation is routinely checked for carelessness or negligence in complying with waste control regulations. Careful inspection is made of disposal devices, pipeline valve leaks, the

Two inspectors prepare to board a rig for routine inspection. Constant patrols and inspections have reduced pollution of Louisiana's coastal waters to the present low rate.

Barges are checked to insure proper disposal of caustic soda cans, and other debris and general waste that is a hazard to fishing and navigation.



The object of the Coastal Waste Control program is to educate mineral operators to the necessity for the proper disposition of crude oil, waste oil, sludge, and oil and chemical-bearing mixtures, and to make continual checks against carelessness, negligence and outright violations.

barges used for crude oil transportation, loading racks, barge loading outlets, and similar operations in which spillage could occur.

Activities for the Coastal Waste Control program are coordinated through the Division of Oysters, Water Bottoms, and Seafoods in the central office. Inspectors report weekly to file summaries of the past week's activity, to file samples, reports, and photographs, and to receive regular traffic procedure for the week.

Coastal Waste Control officers often use commission aircraft to locate pollution conditions and to patrol areas in which possible pollution has been reported.

Due to continuous patrol and strict enforcement of Coastal Waste Regulations, violations have been reduced to a minimum.

Coastal Waste Control personnel try to prevent pollution not only by constant inspections of commercial installations, but also by educating operators in the necessity for the proper disposition of harmful waste products.

A typical inland bay drilling rig is pictured above. These barges are inspected for adequate pollution gates, proper disposal of oil imulsion base mud, leakage, and harmful debris.

Files, kept aboard each Coastal Waste Control boat allow the inspectors to review the nature of previous violations.

Operators in the patrolled areas have been cooperative with the commission in its attempt to control pollution. Most of the violations are the result of carelessness and are corrected within a reasonable length of time. The inspectors often lend ideas to help correct various problems and strive to cooperate with the operators. However, immediate corrections of the Stream Control Commission violations are mandatory.

Because of the transfer and shifting of personnel in the oil and sulphur industries, the education and inspection program is unending for the Coastal Waste Control unit.

In spite of the fact that drilling and production has increased, criminal violations have been kept to a bare minimum—and only one arrest has been made in the past two years.

Extra details performed in cooperation with other divisions indicate consideration of additional equipment and personnel to keep pace with increased demands upon the Coastal Waste Control section.

Refuge Division

RICHARD K. YANCEY
Acting Chief

ALLAN B. ENSMINGER
Chief Biologist

ALLAN B. ENSMINGER

DURING THE PAST two years the program of this division has progressed at a rapid pace in the improvement of wildlife habitat and facilities on five State owned coastal marsh wildlife refuge areas occupying approximately 250,000 acres, and one leased area in north Louisiana comprising 3,300 acres. These include the 83,000 acre Rockefeller Wildlife Refuge in Cameron and Vermilion Parishes, the 85,000 acre Marsh Island Wildlife Refuge in Iberia Parish, the 66,000 acre Pass-a-Loutre Waterfowl Management Area in Plaquemines Parish, the 15,000 acre State Wildlife Refuge in Vermilion Parish, and the Coulee Wildlife Refuge in Morehouse Parish.

Four of these wildlife areas are located in the most remote sections of Louisiana's coastal marsh. For the most part they are subject to tide water conditions from the Gulf of Mexico and are interspersed with bayous, lakes, ponds, and bays. Ground elevations are generally one foot above sea level and most of the marshes are frequently covered by a few inches of water. The pond areas are generally productive of valuable aquatic vegetation while the marshes are covered by dense stands of various types of grasses, depending upon salinities and water conditions. Nearly all of these areas have a potential for improvement as wildlife habitat and it is the goal of this Division to eventually convert each of the marshes into management units from which maximum quantities of food for wildlife will be produced. This program is well under way at this time on all of the refuge areas. Water control impoundments have been constructed over approximately 34,000 acres on the refuges and an additional 18,000 acres of marsh have been improved through means of low water dams, which are designed to prevent excessive drainage during periods of low tides in the Gulf of Mexico. The latter type of development has been used in areas not suitable for the building of levees for the construction of new impoundments. Work is now underway in the installation of levees and water control structures around an additional 15,000 acres on the Rockefeller Wildlife Refuge.

Research work conducted by trained biologists on the refuges has proven that these two types of management are sound methods of improving habitat conditions for wildlife in our marshes, particularly migratory waterfowl.

The areas under management by this division suffered severe losses during hurricane "Audrey" in June 1957, however, these have been fully compensated for during the past two years. A completely new headquarters facility has been installed at the Rockefeller Wildlife Refuge and all other new construction was designed in a manner taking into consideration the possibility of another storm similiar to hurricane "Audrey". With the occurrence of hurricane "Carla" in 1960, the planning of these new facilities proved well worth while since only minor damages were received.

The coastal refuges act as havens for virtually all species of marsh wildlife. Migratory waterfowl utilizes the areas in tremendous numbers while many other important species of bird and animal life, such as muskrat, mink, otter, nutria, alligators, rails, and gallinules abound in quantity. Since the initiation of the improvement program usage by ducks on the Rockefeller Refuge has increased from 100,000 to 600,000, while usage on Marsh Island has increased from 15,000 to approximately 90,000. During the winter of 1960 the refuges under management by this division attracted between thirty-five to forty percent of the world's population of blue geese.

As time goes on these areas will become increasingly important as man encroaches upon Louisiana's remaining wildlife habitat. More and more marshes and wetland areas throughout the State are being destroyed as wildlife habitat by man's activities and full development and improvement of the large refuge areas will aid in compensating in part for the losses. There is no substitute for good food, water, and cover conditions in the maintenance of any game population and this holds very true for migratory waterfowl.

All engineering for the Refuge Division was carried out through the able cooperation of the Louisiana Department of Public Works. This division does not employ engineers since this would be a duplication of effort with the Public Works Department. All purchasing and expenditures are handled by the Division of Administration, or in conformance with the policies established by that agency.

All new mineral leases are issued by the State Mineral Board and rules and regulations are included in each lease for the protection of wildlife on the refuge from damages that would result from an uncontrolled mineral operation. Rules and regulations are prepared by this division, approved by the commission, and incorporated in the leases by the Mineral Board.

Rockefeller, Marsh Island, and State Wildlife were acquired by the State under deeds of donations from private foundations and individuals. Each of the deeds contains very specific terms and stipulations which dictate the manner under which the areas must be operated, and the manner in which the revenues derived from each refuge must be expended. These deeds also contain reversionary clauses in the event that the State should fail to comply with any of the terms and conditions, and for this reason extreme care is exercised in the division's operations to insure against any possible violations of the stipulations in the various deeds.

The Louisiana Wild Life & Fisheries Commission sets forth the policies under which the division operates and these are channeled to the division from the Director in the New Orleans office. Coordination with each of the individual refuges is carried out from the Refuge Division office located in the commission headquarters in New Orleans.

All new development work is based upon past experience and the findings of research. Fact finding programs are continuously carried out by trained biologists of the division in an effort to gather more information on the areas and to develop means of making them more productive. The operation of each refuge is directed by a competent supervisor who is responsible for coordinating the work of all personnel working under him on maintenance and development work. This includes heavy equipment operations, such as the dressing of 175 miles of levees by means of commission owned draglines and the maintenance of all existing facilities including buildings, boats, water control structures, etc. It also includes the construction of any new projects of a minor scale that can be taken care of by the use of commission personnel and equipment. All major contruction jobs are carried out by contract following advertisement for bids through the Department of Public Works.

Management operations are now undertaken on a very large and broad scale and this phase will undoubtedly be completed within the next five or six years. After that time, however, more detailed and specific work will be necessary in order that the potential of each acre of land on the refuges may be fully exercised. This operation is the largest marsh management plan underway anywhere in the United States, and it is one of which the State will eventually be very proud as a wildlife show place. This will hold particularly true in the future as the wildlife habitat diminishes on private lands in Louisiana through the encroachment of man's activities.

In compliance with the deeds of donations and in order to provide an undisturbed resting place for countless thousands of migratory birds, patrol and protection is a major part of the Refuge Division program. Large expenditures each year are placed in boats, motors, and lodging facilities for wardens on the refuge areas.

During winter months patrol activities are focused on the protection of migratory ducks and geese. The birds venture off the refuges but when gunning pressure becomes too great they seek the protection of these areas. Aerial inventories of waterfowl populations in Louisiana show that approximately seventy percent of the ducks and geese winter in the southwestern section of the State. The major difference between this section and other areas along the coast is the vast refuge areas. Without the refuges many ducks would move on southward into Mexico and Central America.

During spring and summer patrol work is centered on protecting alligators on the refuges. These areas now support the greatest concentration of alligators on the continent, while outside the refuges only a scattered few alligators can be found. The alligators have not moved to the refuges but through rigid protection the population on the refuges has increased. Alligators have a high reproductive potential and with adequate protection high populations can be maintained.

To assist in the patrol and protection program the division maintains nine cabin boats, three jet boats, two airboats, six mudboats, and ten outboard hulls and motors. Patrolmen are provided with overnight camps at all strategic locations.

Rockefeller Wildlife Refuge

NED W. CRAIN
Supervisor
BOBBY G. HARMON
Biologist

LANDSCAPING

During July, 1961, plans and specifications for landscaping the headquarters area on Rockefeller Refuge were prepared by Mr. W. W. Wells of the State Parks & Recreation Commission. The landscaping included furnish and installing storm drainage facilities, all plants—including shrubs and trees, and asphalt surfacing around the shop and finished grading. Bids were solicited by the Division of Administration in late September. Work began in November at the headquarters site to improve the drainage system by placing a string of concrete culverts leading from the front of the main office running eastward to resident home number one. At this point the drainage line turned south and emptied excessive water into a drainage ditch south of the headquarters area.

After the area had been graded, leveled, and removed of all stumps, the shrubs and trees were planted as to specifications. In addition, plans and specifications were drawn up for planting shrubs at the West End resident and for pruning and fertilizing all existing trees at the main headquarters. This work has been completed.

In early April the asphalt surfacing of the headquarters area was completed which terminated all landscaping on the headquarters area at Rockefeller Refuge.

WEST END APARTMENT AND GARAGE

Initial construction at the West End resident home site began with the renovation of a double garage in an effort to construct a two story resident home, using the previous garage floor plan and the existing garage roof. A five-inch layer of concrete was poured over the existing garage floor and a six-inch layer poured for a 12 by 20 foot porch on the south end of the building.

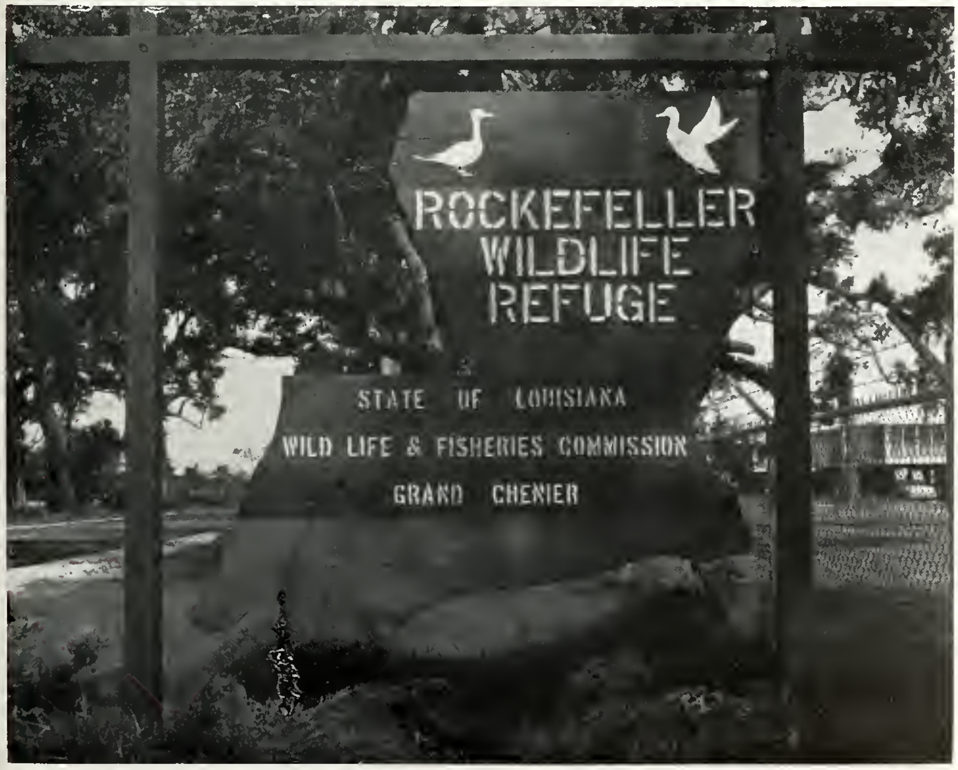
All electrical wiring, plumbing, and building materials were bought on a bid basis. The carpenter work and painting was done by refuge personnel.

In addition a six-inch layer of concrete 20 by 50 feet was poured for a three car garage with a utility room to be built on each end. All work on the building was completed by refuge personnel.

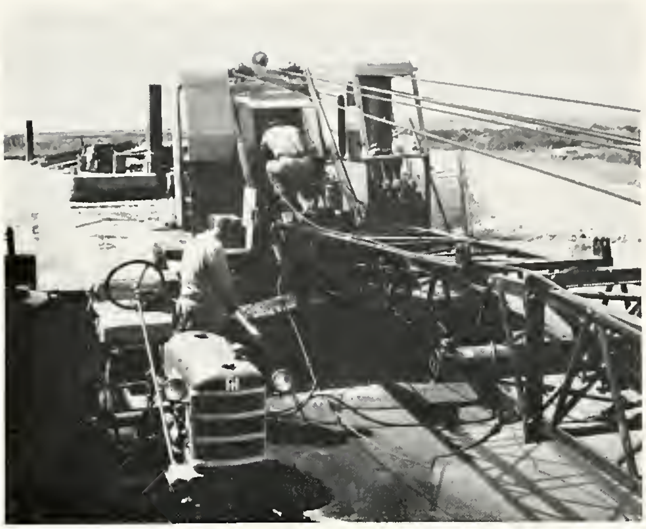
Other development work at West End included weather proofing the west porch of the resident home, which was done by refuge personnel, and the drilling of a 200 foot water well on a bid basis. A new pump and motor was purchased and installed on the new well.

EQUIPMENT MAINTENANCE

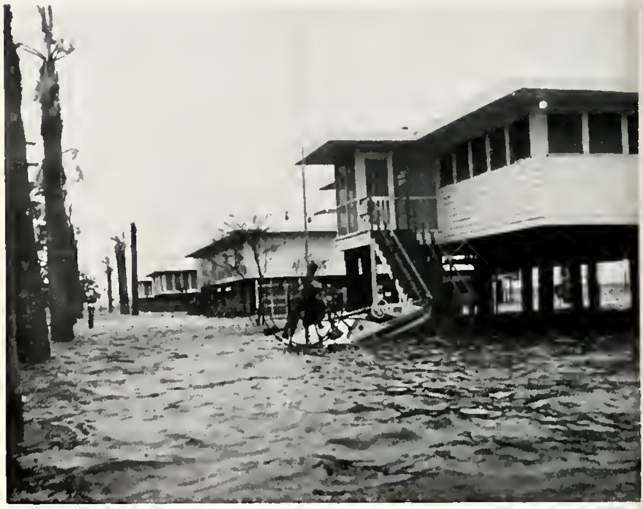
To adequately manage and operate an 85,000 acre marsh wildlife refuge requires owning an enormous amount of equipment. Operating and



The 83,000 acre Rockefeller Wildlife Refuge is one of the most thoroughly managed waterfowl habitat areas on the North American Continent and is a paradise for waterfowl and the many forms of shore birds that visit the Louisiana coast annually.



Intensive maintenance of the equipment is a major part of the refuge operations.



Storm waters driven in by hurricane "Carla" reached a depth of approximately 3 feet at the main headquarters facilities on Rockefeller Refuge.

maintaining this equipment is one of the major problems of refuge employees.

Throughout 1960-61 constant maintenance was applied to all boats, outboards, draglines, marsh buggies, and barges on Rockefeller. All housing units and storage buildings were painted and inspected as needed.

Repairs on mud boats and outboard hulls consisted of scraping and painting the bottoms, changing wheels and rudders, and many other miscellaneous repairs.

All four of the refuge owned draglines required constant maintenance which consisted of steam cleaning, painting, lubricating, changing cables, and other repairs as needed.

The four marsh buggies that are in operation on Rockefeller Refuge require constant maintenance due to the extreme working conditions in the marsh. Each buggy is normally overhauled, cleaned, and painted annually.

All refuge spud and cargo barges were cleaned and painted. Repair work at the headquarters boathouse on a pumping barge that had been damaged by "Hurricane Audrey" consisted of scraping, cleaning, welding, painting, and repairing many water valves leading to different compartments of the barge.

Minor details carried out on all housing units on Rockefeller Refuge consisted of the following steps: racks were constructed in the boathouse to store sheet metal in an orderly fashion, and the light plant stationed at the Lake 14 camp was sent to New Orleans for repairs. All housing units on the refuge were inspected and the necessary repairs were made.

Two redwood plank signs were made by refuge personnel at the boathouse; one was erected at the office and the other erected at the East End Camp.

A complete set of weather instruments, including a recording barometer, a recording thermometer, a recording rain and snow gauge, and a recording wind gauge, will soon be installed. This set of instruments will supply the refuge with records of daily weather data.

STORAGE BUILDING

Plans have been made for construction of a storage building, bulkhead, and loading dock to be located southwest of the boathouse. The area has been surveyed and soil core samples were taken by engineers of the Department of Public Works. In August 1961 design engineers of the Department of Public Works began preparing plans and specifications for this project.

AIR STRIP

Due to the small number of air strips located in the coastal marshes and the frequent visits to the refuge by division personnel in commission aircraft, an air strip 3,000 feet long and 60 feet wide, lying in an east-west direction, was constructed in the experimental area which lies south of the headquarters site.

In 1958 the fill for the air strip was thrown up with a refuge dragline and this fill remained undisturbed until April, 1960. At this time approximately 4,500 yards of native reef shell was spread over the strip to a depth of six inches. This shell was transported to the air strip by dump trucks which carried five yards of shell per load. This heavy load caused numerous soft spots to develop in the air strip, thus more shell was needed to surface the strip than was expected. After spot dumping the shell along the strip it was spread with a motor patrol or grader and then packed and leveled with a track-type marsh buggy. Recently the entire strip was seeded with Bermuda grass. Commission aircraft are using the air strip at the present.

CANADA GOOSE ENCLOSURE

A thirty-five acre experimental area was developed into possible nesting grounds for sixty-four Canada geese which are being held in captivity on Rockefeller Refuge. A five foot high chain link fence with concrete curbing underlying was erected around the area and a series of small ditches and three foot mounds were constructed in the area.

In addition, approximately 250 acres of marsh located in the south half of Lake II will be developed as a feeding area for wintering Canada geese. These efforts are being directed toward attracting the few remaining winter flocks of Canada geese in Louisiana to refuge areas. However, this work is still in the experimental stages.

ANIMAL PENS

In addition to the existing animal pens on Rockefeller Refuge, a new duck pen was built adjacent to the goose pen. This pen will contain young mottled ducks, whereas the other duck pen will hold wood ducks. At the present, young mottled ducks are being raised in one pen with hopes that certain characteristics of young birds of the year may be learned to distinguish these from adult mottled ducks being held in captivity.

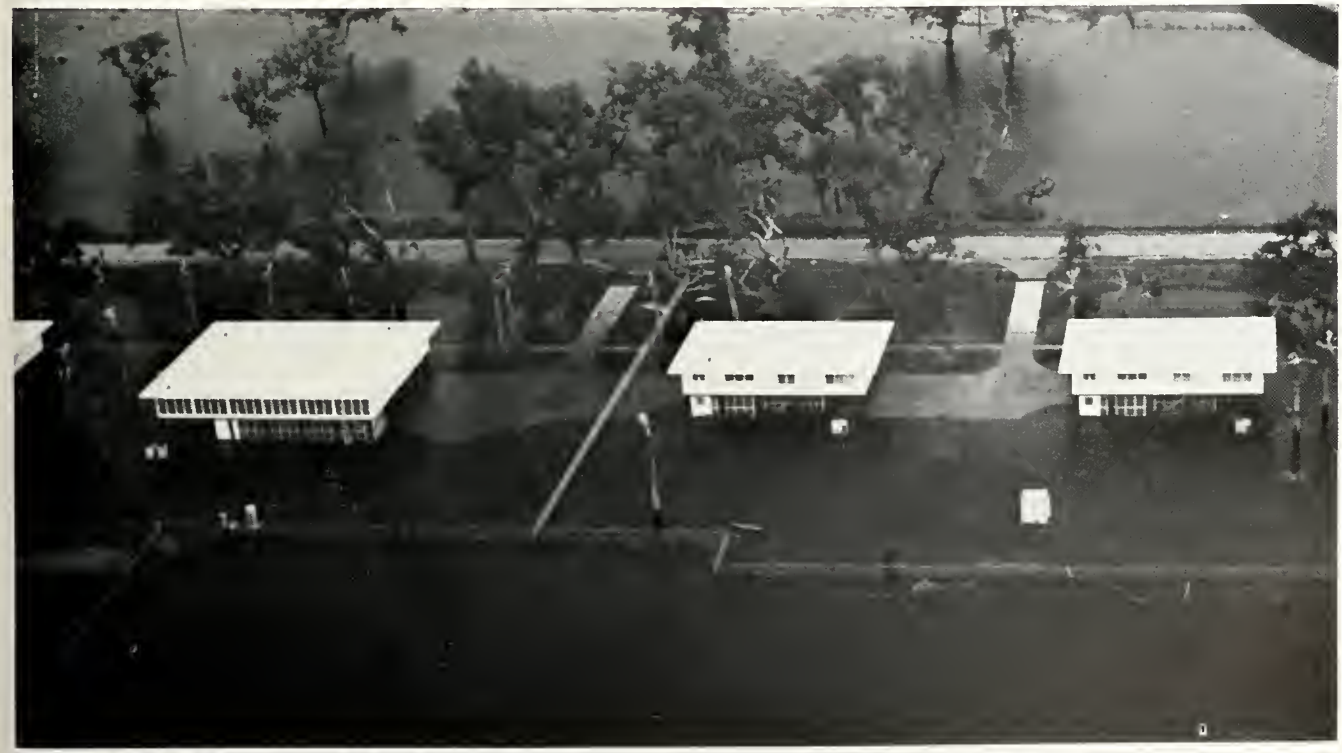
ROADWAY AND BRIDGES

Plans and specifications were drawn up for the shell surfacing of a road between Lake 14 and Highway 82 near the west end of Pecan Island. Bids were solicited by the Department of Public Works. A bridge was constructed across the Property Line Canal which is a reinforced concrete sectional-type such as is used by the Louisiana Highway Department. Refuge personnel constructed the bridge and a refuge dragline constructed a roadbed leading from the bridge to Highway 82.

In addition a road bed was constructed from the East End camp south to the 40 foot boat opening structure. Clam shell was used to surface the road.

LAKES 5 and 6

During the fall of 1960 and the spring of 1961, an additional 18,000 acres of marsh designated as Lake 5 and Lake 6 was leveed on Rockefeller Refuge in a manner designed to prevent salt water from intruding into this area. At the present a contract has been let by the Department of Public Works and work begun on three water control structures across three natural bayous which connect this new area with the Gulf. These structures of concrete and steel construction will be gated for boat passage and drainage. Upon completion of the structures salt water intrusion will be under control. This type of marsh management will stabilize water conditions, prevent certain acreage from being drained of water on low tides, and will eventually create a brackish marsh instead of an extremely salt marsh. The brackish marshes support dense stands of widg-



Extensive damages caused by hurricane "Audrey" in 1957 motivated the construction of the main headquarters facilities on piling 11 feet above the yard surface. This forethought in rebuilding resulted in only minor damages inflicted by hurricane "Carla" in 1961.

eon grass which is one of the best duck foods in southwest Louisiana. In addition, certain acreage of this impounded area is fairly high marsh and is vegetated with wire grass which can be burned annually and thus support a large number of the blue and snow geese that winter in southwest Louisiana.

LEVEE MAINTENANCE

Approximately 150 miles of levees make up the framework of eleven impoundments on Rockefeller Refuge. The major purpose of the impoundments is to suppress the inflow of salt water into the marshes from the Gulf of Mexico and stabilize water conditions to produce maximum quantities of food for wildlife.

During 1960-61 four refuge owned draglines have been redressing levees which were badly damaged by hurricane "Audrey" in 1957. A major portion of these levees have now been redressed and a levee was constructed surrounding a new 200 acre impoundment north of Lake 10.

On September 10, 1961, hurricane "Carla" hit the coast of Louisiana and damaged the network of levees on Rockefeller Refuge. The damage was not as great as in 1957, but numerous breaks were noted and extensive erosion from wave action occurred on all levees. Since hurricane "Carla" all breaks in the levees have been mended and the redressing has progressed according to plans.

DEEPENING PROPERTY LINE CANAL

The Property Line Canal located on the northern border of Rockefeller Refuge, which connects the Superior Canal with the Humble Canal, was filled in considerably during hurricane "Audrey". Since this canal affords boat passage to all portions of the refuge and is used to transport draglines and barges to work locations, it became necessary to redredge this canal.

In early July, Brown and Root Construction Contractors moved into the Superior Canal intersection, under the directions of the Public Works Department, and began deepening the Property Line Canal westward. As of September 30, 1960, all of the Property Line Canal extending to the Humble Canal had been deepened, except for about 1,000 feet extending from the old ferry site southward. During September the contractor moved back into the area and finished the work and an earthen plug was made where the Property Line Canal entered the Humble Canal behind the East End Camp. This work has been completed.

PATROL CAMPS

Since Rockefeller Refuge parallels some twenty-two miles of coast line in Cameron and Vermilion Parishes, and intrudes inland for five or six miles, this enormous tract of land creates a problem of effectively patrolling against trespassing and illegal hunting of wildlife.

To cope with this problem two patrol camps have been built on the Vermilion section of Rockefeller—one camp is located on the southeast corner of Lake 14, while the other camp is located near the gulf on Rollover Bayou. Overnight facilities are available at each camp which is constructed on creosote piling approximately ten feet above ground level. Running water, electric lights, and gas heating is present in each camp. On the Cameron section of Rockefeller Refuge a patrol tower was constructed on the Superior Canal to guard against trespassing. This tower is approximately 40 feet high and affords visibility up to three and four miles. Adjacent to the tower a patrol is under construction at present. The frame work consisting of floor, roof, and sides have been completed by refuge personnel. Completion of this camp will greatly simplify patrol operations in that area. Another camp in the Cameron section of Rockefeller is located at the intersection of the Royalite Canal and Joseph Harbor Bayou. This camp consists of a small box frame building covered with aluminum sheeting and is constructed on creosoted piling. The floor of the camp is seven feet from the ground and is twelve feet above sea level.

The first step in constructing a patrol camp has been completed with the installation of large timber piling to elevate the finished structure well above future storm tides.

Upon completion of these two camps a total of four camps will be strategically located on all four corners of Rockefeller Refuge to aid in better protection of our refuge and wildlife.

REFUGE OPERATION

Approximately fifteen thousand acres of wiregrass (*Spartina patens*) and salt marsh grass (*Distichlis spicata*) vegetation types were burned during early spring of 1961. Two-thirds of this area is located in the Vermilion section of Rockefeller Refuge along west Big Constance, north of Rollover Bayou and west of Pigeon Bayou. Most of the area burned on the Cameron section is located around Millers Lake and the Superior Canal. In late fall each year a complete burning program is scheduled for the different type marshes on the Rockefeller Refuge to improve food conditions for geese and fur bearing animals.

In early spring all gates at the Rollover structure and at Lake 14 and 15 are opened to drain excessive rain water and to start drying up the impoundments for production of wild millet (*Echinochloa walteri*). Due to the high salinity which prevailed in Lake 15, it was decided that the gates should be closed and a crop of widgeon grass (*Ruppia maritima*) be produced instead of wild millet.

Due to excessive rain fall a pumping unit, located on the experimental area directly south of the headquarters site, was operated almost daily. On numerous occasions the gates on the Bertrand water control structure were opened to let water flow into the boat house canal, which empties into the Gulf of Mexico.

HURRICANE "CARLA"

On September 10, 1961, hurricane "Carla" hit the coast of south Louisiana and caused high tides ranging between four and six feet above sea level. These high tides resulting from high winds completely inundated the marshes of the Rockefeller Refuge. All water control structures and gates were opened for about two months to drain off the excessive water. In the experimental area and goose pasture it was necessary to operate the pumping unit for thirty consecutive days to remove storm waters.

Aerial reconnaissance revealed that several of the levees surrounding the man-made impoundments on Rockefeller were breached; however, the camps and buildings which had been rebuilt after hurricane "Audrey" in 1957 were not damaged.

In reporting on possible damage to wildlife, the destruction of bird life was not as great as it would have been if the hurricane had come earlier in the year during the nesting season. Small populations of migratory waterfowl sought refuge in the rice fields north of the marsh.

The major damage in the coastal areas to wildlife was caused among the rabbit, muskrat, and nutria populations. It is believed that the inundated condition that prevailed throughout the marshes on Rockefeller Refuge did not disperse the alligator population as much as had hurricane "Audrey".

NUTRIA TRAPPING

During late summer of 1960 there was a decrease in the nutria population, probably caused by a small die-off, which brought relief from the high population in the past. During the trapping season this past fall at no time were there more than four or five trappers working on the 83,000 acre refuge. The reason for this small number of trappers was probably due to the low prices received from the sale of nutria pelts. At present the nutria are making a come back, and a large population will undoubtedly be present on the refuge by next year.

Plans for the landscaping of the main headquarters at Rockefeller were provided by the State Parks & Recreational Commission, and the sub-tropical plants used blend well with the native oak trees and general architectural design of the buildings.

BOAT OPENING

A forty-foot hydraulically controlled boat opening was completed at the intersection of Humble Canal and Property Line Canal, which is one-half mile south of the East End camp on the Rockefeller Refuge.

This lock simplifies all boat transportation on the refuge and inhibits the flow of salt water northward, which would eventually penetrate the fresh water reservoir lakes of the rice growing area. Also these locks may be opened during periods of heavy rain and thus create a drainage outlet to the Gulf of Mexico to release excessive rain water preventing flooded pasture land in the marsh north of the refuge. This is the largest single project completed to date on the refuge.

STRUCTURE IN WEST FORK OF ROLLOVER BAYOU

This area was surveyed by refuge personnel and engineers from the Department of Public Works and a proposed location selected for the structure south of Rollover Lake. A party from Public Works made field surveys to gain information from which plans and specifications on the structure will be prepared.

WEIRS

On July 1, 1960, refuge personnel began removing the remaining portion of a creosote treated piling and sill weir located on Little Constance Bayou. The old wooden weir had to be torn out before equipment and supplies could be transported further south for construction of a steel sheet piling weir on one of the tributaries of Little Constance Bayou. By the end of July a steel sheet piling weir seventy feet wide was constructed and shell deposited at both ends of the weir to eliminate erosion. This weir stabilizes water levels and water salinities, reduces water turbidity and improves marsh conditions on an area of approximately 700 acres.

All work on this job was performed by refuge personnel. A refuge dragline and other equipment were used during construction.

Marsh Island Wildlife Refuge

HARVEY H. LOURD
Supervisor

CLARK M. HOFFPAUIR
Biologist

WATER CONTROL STRUCTURES

One of the major development programs on Marsh Island has been the improvement of marshes through the installation of Wakefield type weirs for water control purposes. These structures are invaluable in reducing water level fluctuation and water movement. This in turn decreases turbidity and encourages the growth of desirable aquatic vegetation which serves as food for wildlife. Water control structures of this type are necessary as the marsh in this area will not support a levee for an impoundment.

Ten of these weirs were built on Marsh Island in 1960-61. Two large weirs were built on the west end of the refuge. One was installed in Little Charles Bayou, and the marsh affected by it occupies approximately 1,700 acres. The other was built in Bayou Chen and controls water levels over about 1,400 acres. The two large weirs were built of steel sheet piling and were treated with a rust preventive coating. A third weir is now under construction in the east branch of Oyster Bayou. Its completion is expected in December, 1961 or January, 1962. This is the largest weir built as yet by the Commission and is 185 feet in length. The bayou at this point is 125 feet in width. This weir will be set at a minus 10 inches below marsh level rather than the standard 6 inch marsh level as are all the other weirs.

Five more small weirs were built on small cuts and bayous leading into the east branch of Oyster Bayou. In addition three small weirs were built on the west branch of Oyster Bayou in small cuts leading into the main bayou. The ten weirs control a total of approximately 7,500 to 8,000 acres of marshland water levels.

To complete this program of water level control on the east end of Marsh Island it was necessary to build a sheet piling dam in Dynamite Cut. This consisted of two rows of steel sheet piling across Dynamite Cut with the area in between filled with oyster shell. This will completely stop the flow of water through the cut.

CAMPS

Five patrol camps have been built to date. Two of the camps, one at Mound Point and one at the Impoundment levee, were completed during 1959. Three other camps were erected during this current biennial period.

One camp is located on the east branch of Oyster Bayou, one at the west branch of Oyster Bayou, and one at the weir on Scat Bayou #2. They were installed on creosoted pilings approximately eight feet above the marsh with a small wharf leading to the waterway. An 8x8 foot fur shed and storage house was built at the site of each of these camps. The camps are used by both patrolmen and trappers.

WORKSHOP

A twenty by twenty foot workshop was built inside the boat house. This shop serves as a repair room for all motors and small equipment on the refuge.

HEADQUARTERS

The main camp which is located on Bird Island Bayou has required considerable maintenance recently. During the past two years all outside woodwork has been repainted, rusted screens and much woodwork was replaced. The inside of the camp was completely repainted and new floor molding replaced where needed. All flooring and screens on the large porch area were repainted and the necessary repairs made.

The 750 ft. bulkhead in front of the camp was completed, and a suitable light weight backfill placed behind the bulkhead. This structure has virtually stopped all erosion in front of the headquarters on Bird Island Bayou.

During hurricane "Carla" various forms of wildlife took refuge on the elevated main headquarters fill. This doe deer is making use of the maintenance shop in the boathouse.

Pass-a-Loutre Waterfowl Management Area

ELLIS W. LOGA
Supervisor

ALLAN B. ENSMINGER
Biologist

The 66,000 acre Pass-a-Loutre Waterfowl Management Area is located at the mouth of the Mississippi River in Plaquemines Parish and provides some of the best duck hunting in Louisiana. The citizens of the state can be proud of this extensive public waterfowl hunting area because nowhere else in the United States can the average hunter be provided with all of the facilities and hunting opportunities which await him at Pass-a-Loutre.

In carrying out the public hunting program the commission uses a system of applications, drawings, and permits, to insure that everyone has an equal opportunity to make a two-day hunt. The fee for the two-day trip has been maintained at $5.00. In exchange for this small cost the Louisiana Wild Life & Fisheries Commission provides boat transportation from Venice, Louisiana, to Pass-a-Loutre and return. At Pass-a-Loutre a comfortable camp, cooking gear, beds, decoys, duck boats, butane, plus the two-day hunt on one of the finest hunting marshes, is provided.

In addition to the section of Pass-a-Loutre reserved for the public camps, one-third of the area is open to those who wish to make a hunt using their personal equipment and facilities. Free permits good for four days each are issued and a hunter may request as many as he likes. Duck hunting is equally as good on this area as the other portion of Pass-a-Loutre.

Frequent patrols are made to insure against violations.

Two very successful hunting seasons have been completed since the last report. During the 1960-61 season a total of 618 two-day hunting permits were issued and of this total 566 hunters made the two-day hunts.

Due to the shortened duck season of 1961-62 a total of 326 permits were issued, with a total of 299 hunters making the trip.

The number of hunters, fee charged, and the money derived from the present shooting program since its initiation in 1954, are shown in Table No. 1

Table No. 1

Waterfowl Season	*Number of Permits*	*Fee*	*Money Derived*
1954-55	576	$ 2.00	$1,152.00
1955-56	1523	2.00	3,046.00
1956-57	660	10.00	6,600.00
1957-58	569	10.00	5,690.00
1958-59	1143	5.00	5,715.00
1959-60	648	5.00	3,240.00
1960-61	618	5.00	3,090.00
1961-62	326	5.00	1,630.00

DEVELOPMENT

The small earthen plugs and levees constructed by the refuge dragline have proven to be very beneficial in the propagation of desirable food plants for waterfowl. In conjunction with the levee work done by the refuge personnel, we were fortunate enough to have two successive years of high water in the lower Mississippi River. It is from the high river stages that the entire delta complex is maintained. In some areas on Pass-a-Loutre as much as four inches of fertile silt was deposited on the pass banks and inside of some of the ponds. Extensive stands of delta duck potatoes were produced as a result of the manipulation of water conditions in several areas on Pass-a-Loutre. Salt water was present in the river and passes only for a short duration in the fall of 1960, and no damage occurred to the marsh plants. Additional plugs and levees will be installed to further improve this hunting area.

A landing strip was constructed at the main headquarters and has been used extensively by the commission owned airplanes in patrol, maintenance, development, and research activities.

Two large docks have been constructed at the main headquarters and small docks were constructed at each of the nine public camps. These docks greatly facilitate the handling of hunting supplies at the camps, and the large docks provide ample room to safely moor the large boats at the main headquarters.

A fresh water reservoir of approximately three acres was constructed at the main headquarters to supply clean water for the bathroom facilities. Prior to construction of this reservoir water was pumped out of the river and caused considerable trouble during seasons when salt and silt were present in the river.

One of the levees used in the construction of the reservoir was used as a retention levee for filling the yard area at the main headquarters. The Freeport Sulphur Company provided a suction dredge which pumped about 5,000 cubic yards of fill material into the yard area. This company has supplied the main headquarters with electrical power for the past seven years, as well as extending many other courtesies, such as marine repair work and transportation of freight from New Orleans to the area. The fill was sufficient to permit the removal of the old wooden walkways and shell walks installed. Concrete

An airstrip suitable for commission owned airplanes has been constructed at the main headquarters of Pass-a-Loutre.

walks will be installed in the near future and the entire yard area will be landscaped with appropriate shrubbery and trees.

The Department of Public Works has completed a boundary survey of the area and a portion of the boundary has been posted. Appropriate metal signs were made by the sign department at Angola State Prison. Large signs were made by refuge personnel and placed at all of the major entrances to the area informing interested hunters as to where they are permitted to hunt. This survey project will be completed in the spring of 1962. The location and marking of the boundary gives the commission more rigid control of hunting activities in the area and assures the hunters who pay for a two-day trip of not having to compete with unauthorized persons for hunting room. The survey revealed that a large section of land adjacent to South Pass was inside the Pass-a-Loutre area. This piece of land had been considered as belonging to the United States Government, but research work in connection with the boundary survey proved that the land was set aside by the legislative act which created this public shooting area in 1921.

The development of the various mineral leases on Pass-a-Loutre continues to be a problem insofar as this activity is not compatible with ideal conditions for the production of waterfowl food plants. A joint meeting of the Mineral Board, The Texas Company, and a committee from the Louisiana Wild Life & Fisheries Commission was held, at which time several misunderstandings and problems were resolved between this commission and the oil company.

MAINTENANCE

Headquarters Area

Extensive maintenance work has been necessary on the facilities at the main headquarters site. The entire building has been renovated and complete facilities installed to accommodate the large number of personnel necessary during the duck hunting season. All of the repair and renovation work was done by refuge personnel. A large warehouse was constructed out of a boat house which was not being used, and this greatly facilitates the handling of the large amount of supplies and equipment necessary for the public camps.

A large dock was built to replace an old wharf where gasoline is stored. This dock is away from all other facilities to insure safety.

Appropriate signs were placed at the entrance of all major channels on Pass-a-Loutre.

Prior to the construction of an adequate yard fill in 1961, periodic river rises inundated the entire headquarters area.

The new fill at the headquarters area has made it possible to eliminate the wooden walkways and replace them with shell walkways, which will be capped with concrete at an early date.

Public Hunting Camps

Hunting conditions made it necessary that two of the nine public camps be moved to more desirable hunting areas. These camps were moved by refuge personnel prior to the 1961-62 season, and hunters using these facilities were successful in good shooting. All of the camps were in very good condition for the hunting season, and hunters using the public camps were very complimentary as to their comfort.

Decoys, push poles, paddles, and various utensils and supplies for the camps are maintained in good condition and stored in a warehouse at the conclusion of each waterfowl season.

Equipment

The patrol boats, "Sprig" and "Skimmer" were sent to the commission's wharf in New Orleans for repairs. Numerous outboard, tractor, and dragline repairs were made by refuge personnel.

Marsh

The high river stages for the past two summers have been very beneficial in maintaining the marsh at Pass-a-Loutre. Several of the earthen plugs were removed to permit the silt-laden river water to enter the ponds in early spring and summer. One of the largest crops of delta duck potatoes in recent years was produced during the summer of 1961 and proved to be very attractive to wintering ducks. It is hoped that the same conditions exist next summer so that more ponds can be fertilized with the river water.

The restriction of cattle grazing on the pass banks at Pass-a-Loutre has been very helpful in restoring vegetation on the banks which catches and retains silt during spring and summer floods. At present cattle are permitted to graze on two limited areas on Pass-a-Loutre where they will not do damage to the pass bank vegetation.

RESEARCH

Commission biologists at Pass-a-Loutre have collected intensive waterfowl kill data during the past eight seasons at the public camps.

The total kill of the hunters participating in the public camps for the 1960-61 and 1961-62 seasons are presented in Table No. 2.

The information for the past two seasons gives an average kill per hunters' effort of 2.09 during the 1960-61 season, and 2.6 during the 1961-62 season.

A random check of the age ratio was made of all species bagged at Pass-a-Loutre during the

This pair of Pass-a-Loutre hunters returned with a morning's bag of ducks.

The use of waterfowl retrievers has been encouraged at Pass-a-Loutre where extensive mud flats makes retrieving crippled birds extremely difficult.

past two seasons and is presented in Table No. 3.

From the information collected there was a ratio of 1 young to 1 adult during the 1960-61 season, and 1 young to 1.4 adult during the 1961-62 season.

A well marked boundary line surrounds the State Wildlife Refuge.

Table No. 2

Species	*1960-61 36 days 4 duck bag*	*1961-62 20 days 3 duck bag*
Blue-winged Teal	666	213
Gadwall	455	366
Baldpate	378	318
Pintail	295	310
Mallard	201	118
Green-winged Teal	189	74
Shoveller	107	63
Mottled Duck	61	42
Ringed-neck Duck	8	16
Lesser Scaup	4	34
Ruddy Duck	3	1
Black Duck	1	1
Greater Scaup	....	1
Total Ducks	2,368	1,557
Blue Geese	24	4
Snow Geese	2	2
Canada Geese	3	....
Total Geese	29	6
Coots	161	136

A pair of young hunters retrieve their decoys following a hunt at Pass-a-Loutre.

Table No. 3

Species	*1960-61 Season*		*1961-62 Season*	
	Adult	*Immature*	*Adult*	*Immature*
Mallard	21	35	17	3
Gadwall	20	45	35	17
Baldpate	22	28	31	17
Green-winged Teal	8	3	2	1
Blue-winged Teal	70	17	18	5
Shoveller	3	6	4	2
Pintail	32	48	50	62
Mottled Duck	21	12	12	5
Ring-necked Duck	1	4	..	4
Canvasback	..	..	1	1
Lesser Scaup	..	..	1	2
	198	198	171	119

During the past two seasons duck hunting at Pass-a-Loutre has been extremely good and the kill of ducks is well above the state's average.

Hunters making the two-day trip are cautioned in regard to safety and general hunting practices before being transported from the Venice dock to the public hunting area.

State Wildlife Refuge

HAMPTON GREENE

Supervisor

CLARK M. HOFFPAUIR

Biologist

HEADQUARTERS AREA

The main camp at State Wildlife Refuge has undergone considerable remodeling and repair in the past two years. All floors were covered with plastic tile and molding was repleced. The exterior of the camp was repainted and rotten wood was replaced. The wood shingle roof underwent considerable repair, all rotten shingles were replaced, and the roof was given three coats of paint.

A small workshop and storage room was added at the refuge headquarter's site. It is equipped with the necessary tools for small repair jobs and is used to store equipment and supplies. A 16 x 14 foot combination office and bedroom was constructed on the northwest corner of the camp. This also serves as the radio room for the refuge.

TRAPPING CAMPS

Two house trailers obtained from Fort Polk have been temporarily set up on the refuge headquarters site and are used by trappers during the trapping season. If in the future it is deemed necessary they will be moved into the marsh in convenient locations and will then serve the dual purpose of trapping and patrol camps.

AIRSTRIP

The airstrip affords the most convenient access to State Wildlife Refuge. A bulldozer and small tractor were employed to lengthen the strip to 1,200 feet. It is now well drained and mowed and is available to commission light aircraft.

BOAT MAINTENANCE

All boats are maintained by refuge personnel except for large engine overhaul jobs. During the past two years all inboard boats were hauled out once annually, scraped and completely repainted. Minor engine repairs are accomplished on the refuge. Due to the shallow water in which these boats operate, it is necessary to replace wheels, shafts, struts, and rudders very often.

Only minor damages were caused by hurricane "Carla" at State Wildlife.

Coulee Wildlife Refuge

ALLAN B. ENSMINGER

Biologist

The Coulee Wildlife Refuge is a 3,300 acre tract of bottomland hardwood timber and is located in the southern portion of Morehouse Parish. The existence of this refuge area has long been recognized as a key factor for the successful waterfowl shooting on Wham Brake, which is about five miles from Coulee. During past waterfowl seasons this area has provided a resting site for some 30,000 ducks, who venture out to feed on Wham Brake at night and return to the refuge the next day if the shooting pressure is too heavy.

Two water control areas which consist of approximately 1000 acres provide the ducks a suitable resting site.

DEVELOPMENT

The entire boundary of the area has been marked with refuge signs and a white painted line. A bulldozer was employed in 1960 to clear the boundary line along the eastern side of the refuge and to remove any brush and weeds which had grown in the boundary right-of-way along the west and north sides.

Most of the preliminary survey work for a green-timber reservoir has been completed by the Department of Public Works, however, this work has been postponed until some future date. It is felt that an additional water area on Coulee would possibly concentrate an even larger body of wintering ducks which could be utilized by the sportsmen of north Louisiana.

MAINTENANCE

The maintenance work on Coulee during the past two years has consisted mainly of minor repair work along the levee system on the upper and lower water control areas, and the maintenance of a well defined boundary around the refuge. At the time the bulldozer was employed to clear out the east boundary line, several small leaks and low spots, along the west levees of the two basins, were repaired. Small leaks are anticipated in the levee system from time to time due to the presence of decaying trees which were covered in the original construction of the impoundment levees. A close watch is kept on these levees to detect leaks in order that repairs can be made before large washouts occur.

A new entrance gate and several signs were installed along the southern boundary.

Frequent patrol trips have made by agents of the Enforcement Division.

RESEARCH

A total of 20 live alligators have been transplanted on Coulee Refuge from Rockefeller Refuge. All of these animals were marked to insure identification in any future recapture, on Coulee or surrounding areas. This valuable natural resource has been virtually eliminated in most of the state, and it is felt that through an active restocking program, and the present legislative laws, that a harvestable supply of alligators can

A heavy growth of duck weed and coontail was produced in the Coulee impoundments.

be re-established in north Louisiana.

An abundant supply of natural waterfowl food plants are produced in both of the basins. During the past two years a heavy growth of coontail and duck weed dominated the upper basin, while spike rush and sedges are the most common plants in the lower basin.

A dense growth of young willows has occurred in the lower basin and plans have been made to remove these plants in order to maintain as much open water on the area as possible.

If conditions are favorable a duck banding program will be carried on during the next two years.

During the past two years no erosion has occurred around the water control structure spillpipe.

Refuge Division Research

ROBERT H. CHABRECK
Research Leader

IMPOUNDMENT SURVEY

This study was begun in 1958 with the main objective to determine the ecological changes in the nine Rockefeller Refuge impoundments. Sampling work for this report was done in August, 1960, using the line transects previously established.

Monthly checks were made of water levels and salinities in all impoundments and control areas during 1960.

A severe drought occurred during the spring and early summer of 1960, and as a result plant growth suffered greatly. These months are a critical period since this is the main portion of the growing season, and without favorable water conditions, plant growth is affected. During the first six months of 1960 only 9.23 inches of rainfall was recorded on Rockefeller Refuge. It was not until late August that rainfall was heavy enough to bring the water level back to the marsh surface.

Below normal rainfall in the late winter and spring offers certain advantages. In fact the seeds of annual grasses, such as wild millet, foxtail, sprangletop, and others will germinate only on exposed soil, and a shortage of rainfall during this period favors such conditions. However, after the seeds germinate and the young plants reach a height of 8 to 10 inches then an abundance of water or even covering the marsh surface with 2 to 4 inches of water is necessary for vigorous growth. During 1960 the early drying produced an excellent stand of annual grasses, but the summer drought resulted in inadequate moisture and the young plants died.

In all impoundments the water level gradually decreased from January, and by June practically all impoundments were dry, except Lake 8 and 10. This included even the impoundments which were flooded with brackish water to produce widgeon grass *(Ruppia maratima)*. The impoundments remained dry until September.

As a result of low water levels water salinities remained higher throughout 1960, in most cases, than those the previous year.

A considerable decrease was noted in the vegetative coverage of all impoundments during 1960. The average was slightly over 100 per cent. Little change was noticed in the control areas. In some control areas the coverage decreased while in others it increased. The decrease in the vegetative coverage in 1960 from the previous year was probably a direct result of the severe drought. In 1959 widgeon grass made up 37.9 per cent of the vegetative composition of the impoundments but in 1960 only .9 per cent. Also, wild millet made up 6.4 per cent of the vegetation in 1959, but only 1.6 per cent in 1960.

Although droughts seriously affect some species, certain others are benefited. Plants preferring dryer sites, such as *Leptochloa fascicularis* and *Eleocharis parvula* showed sizeable increases in the impoundments during 1960. Also *Panicum dichotomiflorum*, which normally occupies the higher elevations in the marsh, was common everywhere as a result of the drought.

Considerable differences were noted in the various impoundments in 1960. The bottoms of most widgeon grass producing ponds were dry in August when sampled. However, heavy rains reflooded these areas after that time and still produced heavy stands in many areas before wintering waterfowl arrived. Also the drying up of pond bottoms caused certain ponds, which were barren before, to produce dense stands of *Ruppia maratima* when reflooded. In such ponds water turbidity frequently limits aquatic plant growth. Consequently, drying causes the bottom material to cement together, then when reflooded turbidity is reduced since wind action does not agitate the bottom.

Even though the results of the 1960 summer drought was detrimental to plant growth, valuable information was gathered at that time which can be used as a guide for all marsh managers when planning development operations.

From January through June, 1961, the rainfall on Rockefeller Refuge totaled 23.2 inches, over twice that of 1960 for the same period. As a result the marshes failed to dry completely. Consequently, the annual grasses failed to germinate in many areas. However, during this time submerged aquatics made very good growth.

MARSH BURNING STUDY

This study was designed as a pilot type research problem on marsh burning. Objectives were to devise methods of measuring marsh fires and of evaluating them, to measure factors influencing marsh burns, and to measure some of the effects of marsh burns.

Six burns were measured on Rockefeller Refuge in Cameron Parish Louisiana. It was found that the Fenner-Bentley Soil fusion pyrometer did not work in wet soils. A modification of the Fenner-Bentley pyrometer, which was designed to measure temperature stratification, did not work well due to the blackening effect of the fire. This study revealed that field measurement of fire temperatures is a very difficult problem. Temperature measurements above ground level were quite variable during burning.

Water samples after a burn showed an increase in pH, sodium, potassium, chlorinity, and total alkalinity. Soil temperatures on the burned areas were consistently higher than on adjacent vegetated areas. Water samples were not representative of free water samples, but were more representative of soil extracts.

Soil temperatures did not rise during marsh fires if the water level was at marsh level or higher.

It was determined that the nutrient gain after a burn was a result of the deposition of ash.

In all cases the following values on marsh burns were increased: soil pH, chlorinity, phosphorus, and potassium. Calcium increased on five of six burns. It was found that most of the increase in these substances were greatly depleted in 49 days after a burn.

It was concluded that to reduce undesirable plant species in a marsh the water level in the marsh must be below the soil level to insure root damage. If the marsh is burned when the soil is wet, as it is in many cases, the only results would be immediate addition of nutrients to the soil, thus promoting growth of the undesirable plant. This short period of added nutrition is depleted rapidly by tidal action, rainfall, and regrowth.

WEIR STUDY

This study was begun in the spring of 1958, following the completion of three Wakefield weirs in strategic drainage systems on the east end of Marsh Island Refuge. The primary purpose of the study was to evaluate the effects of the weirs on vegetation in the marsh and marsh ponds and to determine the salinity, turbidity, and water level changes behind the weirs. A control area was set up near the weirs and sampled in the same manner for the purpose of comparison.

This report includes the results of sampling done in the study area during 1960. The ponds behind the weirs and the control ponds were sampled, as in the past, in May and again in October. The four marsh transects were sampled in June. These were 1000 feet long, in high, well-drained marsh, and in low, poorly-drained marsh behind the weirs and in identical situations in the control area. Water samples for salinity and turbidity checks were taken from the ponds at the time they were sampled for aquatic vegetation. Tidal information was collected with continuous records from October, 1959 through September, 1960.

Water salinities were very similar behind the weirs and in the control area during the spring of 1960. However, as a result of a prolonged drought during the summer of 1960, water salinity increased around Marsh Island. When rechecked during the fall of 1960, the salinity behind the weirs had increased about 100 per cent, but in the control area the salinity increase was even greater.

In the spring of 1960 very little aquatic vegetation was found in the ponds behind the weirs and even less in the control ponds. When sampled in the fall of 1960 aquatic vegetation in ponds behind the weirs had increased to three times the amount present in the spring. In the control area a slight increase was noted from spring to fall.

Plans for the extensive water control program at Marsh Island is discussed at the job site by refuge personnel and biologist.

Since the beginning of this study the same trend has been noted in ponds behind the weirs. Without exception the percentage frequency of the aquatic vegetation in the fall has been about 400 per cent greater than in the spring.

During the 1960 sampling a record was kept of the algae present in the ponds. This indicated that ponds in both areas had an abundance of algae in the spring, but most of the algae had disappeared by fall in the control area. The ponds behind weirs still had an abundance of algae during the fall.

The marsh transects show that *Scirpus olneyi* is still more abundant behind the weirs in the poorly drained marsh than before the weirs were constructed. However, in the control area this species has changed very little. Since the weirs were constructed *Spartina patens* and *Juncus romerianus* have decreased behind the weirs and increased in the control area.

CATTLE STUDY

This study was begun in the fall of 1958, following the construction of seventeen cattle exclosures on Marsh Island Refuge. The exclosures and adjacent control areas were first sampled at that time. In addition a small levee exclosure was constructed and first sampled in 1958. The Chenier la Croix Cattle Exclosure was constructed in 1956 and has been sampled annually since that time.

During the summer of 1960 water salinities outside the Marsh Island impoundment were over twice as high as those inside the impoundment. Water depths were essentially the same in both areas.

In order to evaluate the cattle usage of various marsh types, hoof prints touching the five-foot transects used in sampling were counted and averaged for each type. The cattle are removed from Marsh Island each year in April, and the vegetation is sampled in August, after the growing season. The question arose as whether or not the hoof prints could still be recognized in August when sampling was done. To determine this the hoof prints were counted in May 1960, soon after the cattle were removed then again in August 1960. A slight decline was noted in the number of prints over the three-month period, but the ratio for different marsh types remained essentially the same. With only this small difference information on cattle usage will be gathered in August each year at the time that vegetation is sampled on the cattle range.

Spartina patens and *Distichlis spicata* were dominants during 1960 and 1961 in the exclosures and control areas, both inside and outside the impoundment. In general, *Distichlis spicata* dominated the area outside the impoundment and *Spartina patens* the area inside. Numerous other species occurred but in lesser amounts. *Scirpus olneyi* made up 8.4 per cent of the exclosure vegetation in low marsh outside the impoundment. In the adjacent control area this species made up only 2.2 per cent of the vegetative composition.

The vegetative coverage was greater in the exclosures than in the control areas, likewise, the vegetation height was greater in the exclosures than in the control area. This can probably be attributed to either cattle feeding or trampling. The vegetation was slightly denser and taller inside the impoundment than that outside.

WATERFOWL FOOD AVAILABILITY

The purpose of this study was to determine the amounts of food available for wintering waterfowl in two impoundments, Lakes 3 and 14 on Rockefeller Refuge in southwestern Louisiana.

This was accomplished by collecting a total of 120 marsh floor samples and 18 vegetative samples from the two impoundments and analyzing the contents therein.

The results showed that seeds from 22 species comprising 11 plant families occurred in the marsh floor samples. Based on pounds per acre and frequency of occurrence in samples, the seeds present in greatest amounts were sawgrass, bullwhip, cyperus, millet, dodder, and widgeongrass. Bullwhip and sawgrass seeds occurred in larger amounts in both impoundments than did seeds of the other major species. Bullwhip seeds amounted to 410.4 pounds per acre in Lake 3, and 65.5 pounds per acre in Lake 14. Sawgrass seeds amounted to 231.6 pounds per acre in Lake 3, and 335.9 pounds in Lake 14. Since neither of these plants has occurred in dense stands in either area for several years the seeds had probably remained dormant in the soil.

Although samples were collected in a dense stand of widgeon grass in Lake 3 and in a dense stand of millet in Lake 14, the amount of seeds of these species were surprisingly low. Widgeon grass seeds averaged 4.6 pounds per acre in Lake 3, while millet seeds averaged 15.5 pounds per acre in Lake 14.

There was little relationship between the vegetative stand composition of the areas at the time of sampling and the seeds that were available in the soil.

Analysis of variance as applied to widgeon grass seeds failed to reveal any significant difference at the 5 per cent level between and within periods.

Over 70 per cent of the seeds of major species occurred within the top four inches of the soil, however, all species of major importance were found as deep as ten inches.

Results of vegetative samples showed a considerable decrease in widgeon grass from October to March. This was attributed primarly to waterfowl usage, since many birds were observed feeding in the area and the discarded remains of this plant seen uprooted and floating on the water.

Although tremendous numbers of waterfowl used both areas during the study, little difference was noted in the seeds available during the wintering season. Food production for ducks in the impoundments is adequate at present.

LESSER SCAUP FOOD HABITS

In recent years the Louisiana coast has wintered over 1,500,000 lesser scaup *(Aythya affinis)*. The scaup arrive in late November and body-up on large lakes, bays, and in the Gulf of Mexico all along the coast.

Since the lesser scaup seldom venture inland until late winter, a study was begun to gain information pertaining to the feeding habits of these birds. An investigation was conducted in March, 1961 to determine if Lesser Scaup were actually feeding off-shore in the Gulf of Mexico, and if so, the kind of food they were consuming, and the amount of food available for these wintering birds. The collection of thirty-two scaup from the Gulf south of Rockefeller Refuge revealed that seventy-six per cent of all gullets contained a small bivalve *Mulinia lateralis*. This small bivalve was the only species present in the scaup gullets and each gullet contained an average of 12.5 grams.

In thirty (30) bottom samples taken from the same area a total of 16.55 grams of marine organisms were present which gave an average of 67.50 pounds of food per acre. From two to four miles offshore there was an average of 147.85 pounds of marine organisms per acre. From two to four miles from shore 85.2 per cent of all marine organisms was *Mulinia lateralis.*

Bottom samples taken inland yielded about the same average poundage of food per acre, but the organisms was *Macoma mitchelli,* a small bivalve which did not appear in the gullets of the scaup collected offshore.

Since an ample amount of food is available for scaup in the offshore area and because of the protection afforded by this area, a large segment of the scaup population is unavailable, to hunters.

BLUE GOOSE PRODUCTIVITY

Biologists of the Refuge Division joined biologists of the United States Fish & Wildlife Service, and other states in a cooperative project to study the annual productivity of blue and snow geese.

Since geese stay together in family groups throughout the wintering season, a large feeding flock can be approached and with the aid of binoculars the adults and young in each family group tabulated. Also stray young and adults are tabulated and a young-adult ratio formulated.

The records revealed that 1960 was a very successful year for blue goose nesting. Of a total continental population of 532,400 birds there were 74,529 families with an average of 2.16 young per family. The per cent young of blue geese on the wintering grounds was 32.2 per cent.

Preliminary investigations in 1961 indicate that this year was very poor for blue goose nesting and may even approach 1954, when only 1.8 per cent of the blue geese on the wintering grounds were young of the year.

WATERFOWL INVENTORIES

In order to evaluate the waterfowl usage of various refuge areas, bi-weekly aerial inventories are made throughout the wintering seasons. The results of the inventories for Rockefeller Refuge and Marsh Island Refuge are listed on the included tables.

ROCKEFELLER WILDLIFE REFUGE

WATERFOWL INVENTORY*

October 1960—March 1961

	Oct. 13	*Nov. 1*	*Nov. 17*	*Dec. 6*	*Jan. 10*	*Mar. 1*
Mallard	3,000	20,000	35,000	45,000	70,000	20,000
Gadwall	10,000	35,000	50,000	70,000	80,000	45,000
Baldpate	15,000	45,000	50,000	60,000	75,000	30,000
G. W. Teal	1,500	30,000	50,000	100,000	110,000	60,000
B. W. Teal	60,000	60,000	50,000	50,000	60,000	60,000
Shoveler	5,000	30,000	35,000	45,000	40,000	40,000
Pintail	10,000	90,000	100,000	100,000	120,000	20,000
Black and Mottled	2,500	3,000	3,000	2,000	1,000	1,000
Redhead	40	50	75	100	100	50
Canvasback	20	40	40	50	50	20
Scaup	50	100	100	500	500	1,000
Ringneck	20	30	50	50	20	10
Ruddy	20	50	60	75	75	50
Mergansers	50	100	200	300	300	100
Blue and Snow Geese		5,000	20,000	70,000	90,000	70,000
Canada		......	......	30	40	10
Coots	2,500	65,000	70,000	70,000	75,000	65,000
Total Waterfowl	109,700	383,370	463,525	613,105	722,085	410,440

*All duck and coot censuses conducted from aircraft by Morton Smith, Waterfowl Biologist—La. Wild Life and Fisheries Commission.

Goose inventories made from the air by John Lynch, biologist, U. S. Fish and Wildlife Service, of the total of geese: 5% were Snow Geese, 95% were Blue Geese.

MARSH ISLAND REFUGE

WATERFOWL INVENTORY*

October 1960—March 1961

	Oct. 13 1960	*Nov. 1 1960*	*Nov. 17 1960*	*Dec. 6 1960*	*Jan. 10 1961*	*March 1 1961*
Mallard	100	2,000	3,000	3,000	3,000	1,000
Gadwall	1,000	20,000	20,000	12,000	7,000	7,500
Baldpate	1,000	15,000	14,000	10,000	3,000	3,000
G. W. Teal	Tr.	1,500	2,500	5,000	1,500	1,500
B. W. Teal	4,000	8,000	10,000	5,000	3,000	8,000
Shoveler	500	4,000	10,000	10,000	5,000	12,000
Pintail	4,000	10,000	6,000	5,000	3,000	1,000
Black and Mottled	500	500	400	300	100	100
Scaup	.....	.....	5,000	10,000	10,000	30,000
Mergansers	.....	.....	100	250	500	500
Total Ducks	11,100	61,000	116,000	150,550	127,100	109,600
Blue & Snow Geese	1,000	10,000	12,300	20,000	66,900	5,000
Coots	1,000	5,000	10,000	150,000	4,000	3,000
Total Waterfowl	13,100	76,000	138,300	185,550	198,000	117,600

*All duck and coot censuses conducted from aircraft by Morton Smith, Waterfowl Biologist—La. Wild Life and Fisheries Commission.

SARCOSPORIDIOSIS IN DUCKS

Although Sarcosporidiosis has been evident in wild ducks for many years, it is only recently that keen interest has been reported by hunters in southwest Louisiana in regard to the parasite. It is a problem of growing concern and a common topic whenever hunters gather to discuss hunting success. The main problem lies in the fact that many hunters check the ducks and discard infected ones, considering them unsuitable for table use.

The organism *(Sarcocystis rileyi)* is a microscopic spore of the protozan parasites, crescent-shaped with one end rounded and the other pointed and having a nucleus and many granules in the cytoplasm. The spores occur in colonies and are enclosed in a cyst membrane. In the host the cysts appear as elongated white bodies, much like grains of rice, and vary in size from microscopic to one-quarter inch in length. The cysts are imbedded in skeletal muscle, between the muscle bundles and lying in the same general plane as the muscle fibers. In infested birds these bodies may be found in either the breast, wing or leg muscle tissue and are clearly visible when the skin is removed.

A total of 255 ducks were examined during the 1960-61 hunting season and of this number 21.6 per cent showed the presence of Sarcosporidia with 8.2 per cent having light infestation, 9.4 per cent intermediate infestation and 4.0 per cent heavy infestation.

The sample on most species was too small to be of significance. Of 100 mallards checked 13.0 per cent hosted the parasites and of 67 pintails 43.3 per cent contained them.

It is generally accepted that Sarcosporidia is neither harmful to the infected ducks nor to persons eating infected ducks when well cooked. However, many hunters refuse to use ducks containing the parasites.

A large number of hunters inspected the ducks for parasites before using them for food. Infected birds were either given away or discarded. As a result a tremendous number of ducks were discarded during the 1960-61 hunting season. Attempts to solve this problem with publicity may only aggravate it and make more hunters aware of the parasites.

ALLIGATOR GROWTH AND MOVEMENT

The alligator was once very common throughout coastal Louisiana but in recent years the population has declined to a very low point. Special efforts are being made by the Louisiana Wild Life & Fisheries Commission to devise management techniques for aiding this valuable reptile.

Although alligators have been harvested in Louisiana for many years no detailed studies have been conducted on the life history of the animals. In 1960 a study was begun to gain information on the growth, movement, and longevity of alligators. For the study alligators on Rockefeller Refuge were captured, marked and released with hopes of recapturing the marked alligators at a later date. The alligators were captured at night with wire snares. They were approached by boat and the snare slipped over the animal's head, then tightened. The alligators were then wrestled into the boat and body measurements taken, including; weight, total length, tail length, snout length, girth, hind-foot length, and sex. The alligators were marked by a combination of toe clipping, clipping a dorsal tail fin, and tagging.

A total of 608 alligators were captured and marked during 1960 and 1961. The alligators ranged from one to seven feet in length and were released soon after capture. During the study a total of 48 recaptures were made. The length of time tagged varied from two weeks to two years. Although many gaps still remain in the data, there are indications that the growth rate is slightly greater than formerly believed. When hatched the alligators averaged nine inches in length. Plotted growth curves indicate that the alligators growth is rapid for the first three years. After this the rate continuously declines each year.

The data also suggests that there is little movement in young alligators from one area to another. Several alligators were recaptured in the same area where they were captured and released the previous year.

ALLIGATOR NESTING

Although adult alligators have few natural enemies the nests and young are frequently destroyed. Predators, such as the raccoon will dig in the nests and eat the eggs. Also tremendous ant colonies invade alligators nests and may destroy the eggs or young. Flood water and storm tides, such as hurricanes "Audrey" and "Carla", will completely destroy alligator nests in a large area. Young alligators fall prey to many animals, such as the raccoon, heron, various snakes, fish, otter, etc. Under intensive management these decimating factors could be easily eliminated by hatching and rearing the young under artificial conditions. The hatching of alligator eggs under artificial conditions has been attempted by others with varying degrees of success. However, no information is available as to temperature variation in alligator nests and the activity of the female during incubation. In June, 1961 a study was begun to determine the temperature variations in an alligator nest and to determine if the female alligator visited the nest during incubation.

For determining the nest temperatures a Taylor Model 791 Dual Remote Recording Thermometer was used. This thermometer has two remote thermocouples and the temperature of each is recorded on a clock-driven chart. One thermometer was placed inside the nest to record continuous nest temperatures. The other was stationed outside to record air temperatures to be used for comparison. Temperatures within the nest at the egg cavity averaged 83.5 degrees Fahrenheit with 78 degrees the lowest recorded. and 88 the highest. The daily temperature variation did not exceed five degrees inside the nest.

Air temperature at the nest side averaged 85 degrees, however, temperature extremes were 70 and 102 degrees. The daily variation averaged 16 degrees.

A Stevens Model F Recorder was used to record animal movement across the nest. A trip-wire stretched above the nest to the recorder marked the exact time of each crossing on a chart. It is common belief that the female alligator crosses the nest daily during incubation and with each crossing urinates on the nest. Supposedly, this speeds decomposition of the nest material and, consequently the heat liberated by decomposition aids incubation. However, during the study no crossings were recorded on the nest but the eggs hatched on schedule.

ALLIGATOR RESTOCKING

In May 1961 the Louisiana Wild Life & Fisheries Commission approved the removal of alligators from Rockefeller Refuge for restocking and propagation purposes.

The conditions under which this program was to be conducted:

1. Police Jury of the parish concerned requests the restocking effort.
2. That the landowner apply by letter for a release of alligators on his lands.
3. That no more than 30 to 40 alligators were to be released per 10,000 acres of suitable habitat.
4. That the stocking sites be selected on the basis of biological merit.
5. That agents of the Enforcement Division be advised of releases made.
6. That the U. S. Fish & Wildlife Service first approve the program.
7. That the stocked areas be closed for three (3) years.

Since the alligator population in Cameron Parish was very low the Police Jury agreed to close the season for five years and requested the restocking program.

During the summer of 1961 personnel on Rockefeller Refuge captured and released 112 alligators in Cameron Parish. All alligators were tagged, measured and sexed before release. When the season reopens in 1966 valuable information can be gained from the tagged alligators that may be taken at that time.

NUTRIA MOVEMENT

Nutria (Myocastor coypus) may be seen moving about at any time, but questions frequently arise as to the time of day that the animals are most active. It is a common belief that nutria are crepuscular, with greatest movement at dawn and dusk; however, this has not been verified by detailed studies.

In December, 1959 a study was initiated on Rockefeller Refuge to determine nutria activity at various times throughout the day.

Since nutria follow a well-defined trail when traveling from one place to another, a recorder placed on a trail made it possible to determine within a five-minute period the time of day that each nutria passed through the trail. It was assumed that changes in nutria activity throughout the day would reflect as changes in movement through the trail. A Stevens Water Level Recorder, Type F, was modified and used for the study. The recorder was placed five feet from a well-used nutria trail and a trip-wire was stretched across the trail, about three inches above the ground, so that each nutria crossing the trail moved the wire. Each movement of the wire was marked on a chart by a pen inside the recorder as it slowly moved across the chart. The pen was clock-driven and moved the full length of the chart, 9.6 inches in 24 hours.

For the purpose of classification each day was broken down into four separate periods. These periods were set according to the light intensity, since light intensity seemed the primary factor regarding nutria activity.

Nutria activity for the various periods followed the same general trend throughout the study with several exceptions. The reason for the exceptions is not fully understood but possibly reflects the effects of weather conditions.

Nutria movement through the trail per hour was greatest on an average period at night. The dawn period ranked second and showed slightly less activity than did the night period. In third place was the sunset period. Least movement occurred during the daylight hours. Less than one-tenth the number of animals used the trail at this time as did during the night. Nutria crossings were approximately twice as great one hour before sunrise than one hour after sunrise. Also, the nutria crossings one hour after sunset were approximately twice as numerous as those before sunset, exactly the opposite as that for the same intervals at sunrise.

Although nutria crossed the recorder at all hours of the day, the study clearly shows that movement is far greater at night and that the animals can well be classified as nocturnal. Movement at dusk increased as light intensity decreased, while at dawn movement decreased as light intensity increased.

SHRIMP SURVEY

The many canals on Rockefeller Refuge greatly increase the acreage of the deep water tidal areas on the refuge and afford a tremendous amount of shoreline. In June, 1961 a study was begun to determine the extent to which these canals were used as nursery grounds for shrimp and to determine the growth rate and survival of shrimp trapped inside a land-locked canal.

When initial sampling began on June 2, 1961, only small brown shrimp were found in the canals, but on July 11, small white shrimp began to appear in the samples. On August 14, the brown

Large flocks of blue and snow geese spend the winter on Marsh Island Refuge where three cornered grass is in abundance.

shrimp began to disappear and white shrimp became more evident. By mid-September only white shrimp were found in the canal.

With hurricane "Carla" in September shrimp of all sizes were deposited in the canal making it impossible to recognize the original size classes.

The brown shrimp trapped in the land-locked canal showed good survival rates and growth until they reached a certain size. While in the two and three-inch class the shrimp grew at a rate of about one-quarter inch per week, but after reaching four inches the growth declined considerably.

BARN OWLS IN COASTAL MARSHES

Although the Barn Owl (Tyto alba) is usually associated with agricultural or wooded areas, this species has been frequently encountered in the coastal marshes of Louisiana. The fact that coastal marshes are a somewhat unique habitat for barn owls, yet one that produces an abundance of potential food items, stimulated interest in this study.

The primary purpose of the study was to determine the foods consumed by barn owls and to associate this with the availability of such foods. Also, the study was to serve as a check on the relationship between barn owls and the fur-bearing animals and game species in coastal marsh areas.

In order to determine the foods used by barn owls, pellets were collected at intervals at various locations on the Marsh Island Wildlife Refuge. The pellets, containing hair, feathers, and skeletal parts, represented the undigested portions of the prey eaten and well-served as an indicator of foods used in the area. The pellets were collected on a tree-covered portion of the Gulf beach, around around a trapper's camp, at the main headquarters camp, and under a steel radio tower on the refuge. A total of 804 pellets were collected over a six-month period, from November 1959 to April 1960. After collection the pellets were placed in water, dissolved, then all remains recovered — with the exception of hair and feathers — and sorted according to species.

Analysis revealed that the pellets contained 1,008 vertebrate animals. Of this number 984 (97.5 per cent) were rice rats *(Oryzomys palustria)* and 24 (2.5 per cent) were passerine birds. The pellets averaged 1.22 rice rat skulls and 0.03 bird skulls each.

In order to determine the small mammals present on Mars Island, Victor Mouse traps were set for 300 trap-nights. During this time only rice rats were captured. The fact that rice rats were the only small mammals found in the owl pellets and by trapping suggested that the rice rat may have been the only small mammal present, hence available to barn owls in the study area.

The young of nutria *(Myocastor coypus)*, muskrat *(Ondatra zibethica)*, swamp rabbit *(Sylvilagus aquaticus)*, and mink *(Mustela vison)* did not occur in the pellets, yet were available to barn owls. The nutria population was very high during the study and since the young are both nocturnal and precocial were highly available to barn owls.

Water Pollution Control Division

KENNETH E. BIGLANE
Chief

> *"The public welfare and interest of the people of the state require the proper conservation, development, use, and protection of the inseparable land and water resources."**

KENNETH E. BIGLANE

A SURGE OF PUBLIC awareness of water pollution problems, on a national and local level, high-lighted and influenced the activities of the Division of Water Pollution Control during this biennium. Water pollution control authorities in the nation will agree that national attention to this field has been directed to an all time high and has resulted in an urgent demand to clean our polluted streams of harmful municipal and industrial wastes. The public news media has found that articles on all phases of water pollution considerations, such as legislation, sources of contamination, enforcement proceedings, researches on industrial wastes, and municipal sewage plants, are being favorably received by the nation's readers and television viewers.

A number of events have led up to the mass news coverage of pollution of the nation's surface waters. Basically, the trend started when individual state and U. S. Public Health Service scientists agreed that the problems of water pollution control were rapidly getting out of hand. The nation's future security was actually being threatened by industrial and municipal activities which were at that time, or in danger of, seriously affecting the country's water supplies.

Public Awareness on the National Level

Mild national interest on the problem was displayed in 1956 when the 84th Congress passed Public Law 660. This legislation revitalized federal assistance to state water pollution programs, hesitantly strengthened federal laws on the subject, and provided matching funds to communities for the construction of municipal sewage treatment plants. Congress and the country soon realized, however, that money and laws alone would not correct negative notions and apathy demonstrated by some of the public, many industries, and some municipalities. It soon became apparent that all of the problems associated with water pollution would have to be placed before the general public. For too long, the nation's authorities and scientists in the field of water supply and waste disposal had held their conferences, discussed their problems and technical papers unto themselves and collectively reached the conclusions that: (1) Pollution of the nation's waters was severe, (2) Pollution was increasing, and (3) Something should be done about this pollution. Like many other fields of endeavor, the public was generally unaware of the problems, did not understand how they arose and how they could be corrected, and for the most part, had no appreciation of the disastrous predictions forecast by the learned individuals associated with the issues. Once the facts of a situation involving national security are presented to this public, then warranted actions will necessarily follow. The concept of action through public awareness programs is an integral part of this country's history. Many national movements, from the Revolution of 1776 on through to the present space age development of missiles, first had to win mass public acceptance and support. The world has recognized that the American public is an intelligent, fair-minded nation of people, given to quick action when the need arises.

Thus, in 1959, the U. S. Senate elected a Select Committee on National Resources and gave it the awesome task of ascertaining for the Congress the nation's complete water resources activities as they are related to the national interests. These studies were to incorporate the expected needs of water, quantity and quality, by the nation between 1959 and 1980. This Committee held numerous hearings across the entire country in 1960 and the information gathered is believed to be the most complete and comprehensive data ever compiled regarding the nation's ground and surface waters. These hearings attracted widespread attention and testimony was given by multitudes of persons who were directly or indirectly connected or concerned with these resources in each state.

---

*Portion of Declaration of State policy regarding surface waters, Louisiana Acts 1958, No. 363.

As the Senate Committee's hearings were nearing completion, the President called for a National Conference on Water Pollution. This Conference convened in Washington, D. C. in December, 1960, and was attended by more than 1200 representatives of municipal, state, and federal water quality management people, agricultural, industrial, and recreational interests. The purpose of the conference was to assess the problem of water pollution, to determine its effects upon the national welfare, and to set realistic goals for its control. Thirty recommendations were set forth by the Conference. One of the most important recommendations called for a publicly accepted Credo indicating: (1) Users of water do not have an inherent right to pollute, (2) Users of public waters have a responsibility for returning them as nearly clean as is technically possible, and (3) Prevention is just as important as control. For the first time then, the nation was asked to understand the vast problem and give support to those who were trying to solve it.

Spurred on by the new President's message to the 87th Congress on February 23, 1961, in which he requested the enactment of legislation to "strengthen enforcement procedures to abate serious pollution situations of national significance", a rash of congressional legislation on water pollution considerations was proposed in both Houses. Senate Bills 45, 120, 325, 571, 861 and 1475 all purported to amend the existing federal act to provide for more effective programs of water pollution control. From the House of Representatives came more legislation. H. R. 4036 was defeated but H. R. 6441 arose as being most likely to succeed. This time, there was nothing hesitant about increasing federal enforcement powers over the surface water of the nation. The phrases "navigable waters" and "coastal waters" were written into the enforcement sections for inter and intrastate measures.

When the existing Federal Water Pollution Control Act was successfully amended in July, 1961, a general interpretation of the enforcement section might read: "If you (the state) cannot get the job done on the nation's watersheds, we (the U. S. Secretary of Health, Education and Welfare and the U. S. Attorney General), stand ready, anxious, and willing to do it, not *for* you, but *for* the nation." An interesting observation on the new federal law was made by the

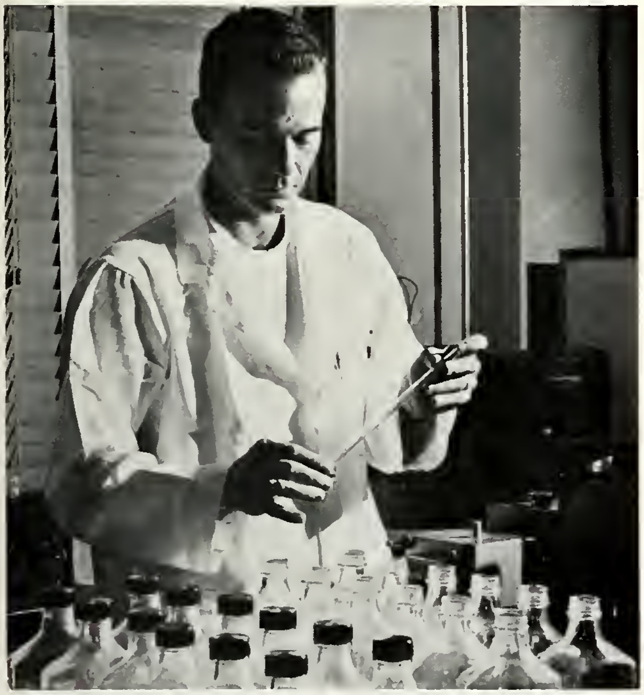
The survey craft Blue Gill II is shown here on its regular patrol in the Baton Rouge harbor. Assistant Chief, R. A. LaFleur, on deck, and "Skipper" Dr. R. T. Gregg, Biologist, will collect industrial wastes effluent samples from the large Baton Rouge Chemical Complex.

writer when he was invited to a regional meeting of industries who sponsored a private waste control section. The featured speaker for the industries made the statement, "In the light of new federal powers in the field of water pollution, perhaps we should start paying more attention to the governmental agency administering to this act." The writer countered with the belief, "It is time that you started paying more attention to your state water quality authorities for now, they are the only ones that stand between you and federal action."

The State of Louisiana has in the past and will continue to demonstrate a sincere desire to curtail all instances of water quality deterioration. The State also has the aim and policy to keep its present industry, to seek new plants, and to preserve the high quality of water now enjoyed in most of the watersheds in Louisiana. The manner in which these deeds can be accomplished will be explained later in detail. First, however, we must review those events which focused attention on water pollution problems in the state during 1960-1961.

Public Awareness at the State Level

The year 1960 was not quite two weeks old when the Division Headquarters in Baton Rouge began to receive frantic phone calls about the terrible tastes and odors in public water supplies drawn from the Mississippi River below Baton Rouge. Division Biologists sampled the river and determined that a chemical, phenol, was creating this obnoxious condition. Phenol, by itself, is capable of creating a taste in water supplies in the incredibly small concentration of 0.01 parts per million. Since all public water supplies drawn from the Mississippi River are dosed with chlorine as an antiseptic measure, phenol mixed with the chlorine inside the water treatment plants formed a chlorophenol. Chlorophenols create tastes in water supplies in even smaller concentrations than phenols by themselves.



Jim Mathis, chemist, operates the Beckman Flame Potentiometer. Samples are from the Mississippi River quality survey. This procedure enables the analyst to obtain quick results when testing for dissolved inorganic salts.

A quick check of industries in the Baton Rouge area soon revealed the fact that one of them had lost a quantity of phenol because of a pipe rupture. By the time this was discovered, enough phenol had been lost to contaminate the water supplies of nearly one million people. Every conceivable news service carried the story and every move made by this Division. The State Board of Health, and the Stream Control Commission was covered and reported. It was as if some gigantic, fatal catastrophe had occurred and people were on the verge of panic. The sale of bottled water from outside sources soon became a thriving business. Tons of foodstuffs, hundreds of cases of soft drinks and other beverages had to be thrown away, and doctors were beseeched with phone calls from mothers worried about their babies' and their families' health.

Although the condition only prevailed for four to five days, the fear of what can happen to a water supply will be remembered by tens of thousands of people for many years to come. All of the previous publicity on the effects of water pollution were suddenly brought home in a vivid manner.

Five days after the phenol was spilled into the river, this Division had an emergency warning system plan in the hands of every industry discharging wastes into the Mississippi River from Baton Rouge to below New Orleans. The plan called for:

1. Formation of a pollution control section in each plant.
2. Daily analysis of each plant's discharge.
3. Names and phone numbers of every domestic water station below that particular plant's discharge. In case of an accident, the downstream users would be notified immediately.

The plan was voluntarily accepted by twenty-four industries and they sent reports to the Division Headquarters once a week containing a summation of their daily analysis. In March, 1960, another phenol spill was detected and the telephone alert was sounded. This time no polluted waters entered any water plant and public water supplies were protected. An oil barge sank later on in 1960 and again, the emergency alert system prevented damage to water supplies. Still later, several mishaps involving oil spills from the loading of ships caused the alert to be sounded and again, prevented pollution of public water supplies. The State Board of Health, Division of Public Health Engineering, helped finalize the plan and had it incorporated into their domestic water surveillance program.

Anti-Pollution Legislation

In the 1959 Legislative Session, the Division attempted to correct certain deficiencies in one stream control statute. Act 203 of 1952 provides for an open season of discharge by industrial installations in the agricultural irrigation sections of the state between October 1 and December 31 of each year. The Act does not provide for the protection of natural resources during this time and, in fact, human lives could be endangered. The Act nullified all other existing anti-pollution statutes except the Stream Control Act. Exactly how the two Acts may conflict has never been argued before the courts. Because the 1959 Session was fiscal, it was advised to wait until 1960 in order to repair Act 203. In the fall of 1959 an industry situated on the Calcasieu River released a basin full of very powerful waste into this watershed. A water pollution resulted and many thousands of fish were killed. Charges were filed against the industry under R. S. 56:322. The attorney for the industry was successful in getting the charges quashed based on the faulty design of Act 203.

In 1960, the Division was called upon by certain members of the Legislature to submit anti-pollution measures. Responding, the Division saw three bills accepted by seven authors from the House and Senate. Two of the measures had to do with the gradual, but final, curtailing of oil field brines into the fresh, surface waters of the state. The third measure, the so-called "mathematics bill", set broad stream classification limits to be met by anyone discharging into the surface waters of the state. The bill was not written to take any powers away from existing Stream Control Commission statutes. It would, however, allow faster, more direct action against one who intentionally, or through negligence, causes water pollution.

All three measures failed to get House Committee approval and therefore, expired for the session. Opponents of the measures successfully used the argument:

> "The existing Stream Control Act contains all the laws needed by the state to stop stream pollution."

A short discussion of the Stream Control Act is necessary in order that certain appraisals can be made of the statute.

An Appraisal of the Stream Control Act

The Act setting forth the membership and authorities of the Louisiana Stream Control Commission may be found in Louisiana Revised Statutes, 1950, Title 56, Sections 1431-1445. The Commission is ex-officio and is composed of the heads or their authorized representatives of the Louisiana Wild Life & Fisheries Commission, the State Board of Health, The Department of Agriculture & Immigration, The Department of Conservation, The Attorney General, and The Department of Commerce & Industry. Its Chairman is the Director of the Louisiana Wild Life & Fisheries Commission and its Executive Secretary is the Chief of the Division of Water Pollution Control, Louisiana Wild Life & Fisheries Commission.

Because the Stream Control Commission does not have any legislative appropriations, it must depend on the Division of Water Pollution Control, Louisiana Wild Life & Fisheries Commission, for field, laboratory, and clerical personnel. The Commission's main job is that of establishing policy and standards for the state's various watersheds. Enforcement, however, is a necessary duty and many agenda are filled with hearings on Notices of Determination, Temporary Cease and Desist Orders, and revoking of discharge permits. It is not surprising therefore, to sometimes find the Commission under temporary injunctive orders from the Courts prohibitting the enforcement of their utterances. Injunctive orders are usually issued at face value to a party who feels himself aggrieved by Commission actions. Motions for the injunction generally infer that pollution, as it is defined in the statutes, does not apply to them. What generally follows, is a lengthy, involved technical discussion and legal argument before the Commission. If the involvements are not settled to the extent that pollution is stopped, the entire case is tried again before the courts in East Baton Rouge Parish. If the Court rules that a pollution is occurring, then the decree of the court takes the place of the order of the Commission.

Although a great deal of time is consumed via this route of enforcement, there is some merit in these procedures. The Louisiana Stream Control Commission has been adjudged by many to be one of the fairest, most impartial, and sincerely dedicated commissions to be found anywhere. Any citizen who has a complaint regarding water pollution is always welcome to speak before this body. The Commissioners question every detail of biological and chemical findings by the technical staff and translate all scientific findings to the understanding of all concerned. No details are overlooked and no chance to help, by consultation, is bypassed when an industry or an individual finds that he is or will be seriously affecting the quality of state waters. The Commission, after all, was not created as a deterrant to the industrial development of the state. Its greatest function, in this regard, is helping to provide those methods whereby industry can locate in a watershed and have the quality of water maintained in this watershed. There is a dearth of knowledge and a lack of trained personnel in the private practice of water pollution control in this state. For this reason, the Commission and its technical staff many times finds that the only source of information to correct waste discharges lies only within their files and with their experienced personnel. This is always a grave responsibility, but the Commission determinedly accepts these tasks.

The Act speaks of pollution but does not set forth limits that may constitute same. In order to compensate for this, the Commission may set forth quality standards which must be met in each stream. This necessitates keeping a constant evaluation of each watershed so as to maintain that quality "in relation to the public use." If these standards are not met, then a violator has broken a Commission regulation and not a legislative statute. Realizing this, an oil company explored the constitutionality of the Act in 1947 before a Federal District Court. The Court held the Act to meet the test of due process and not to conflict with the prohibitions of the State Constitution. The Court mentioned, however, that *the Act violates the State Constitution in that it vests power in the Commission to declare what conduct shall constitute a misdemeanor, a power that can be exercised only by the Legislature,* but as no criminal action under the Act was before the court, it did not decide this point.

It is important to point out at this time, that in Civil cases arising out of riparian rights, there are few, if any, reported Court decisions in Louisiana *where damages have been refused* to an injured riparian owner on the grounds that the upper riparian had a right to cause the injurious pollution.

Laboratories and offices of the Division of Water Pollution Control are located in this wing of the Geology Building on the Louisiana State University Campus in Baton Rouge.

TECHNICAL INVESTIGATIONS

ROBERT A. LaFLEUR
Assistant Chief

DR. RICHARD T. GREGG
Biologist

LOUIS R. KUSS
Chief Chemist

D. B. REED
Engineer

THOMAS J. GILBERT
Biologist

BOBBY F. DOWDEN
Biologist

CHARLES R. ALLOR
Chemist

JAMES S. MATHIS
Chemist

Today, more than ever before, great emphasis is being placed upon the conservation of our nation's natural resources. The State of Louisiana, endowed with unequaled supplies of water, has made great strides toward insuring that these now existent supplies are not rendered unsuitable for consumptive, navigational, recreational or industrial use.

This program of safe-guarding the waterways of this state, by means of biological and chemical investigations, is the responsibility of the Division of Water Pollution Control, a division of the Louisiana Wild Life & Fisheries Commission. This organization is built around two large laboratories, located on the campus of Louisiana State University, Baton Rouge, Louisiana. Our presence in Baton Rouge on the campus of one of the nation's finest universities affords not only a quiet academic surrounding with complete library facilities, but also an available supply of experts in fields ranging from bacteriology to zoology. In addition, it enables this organization to keep a finger on the pulse of one of the greatest industrial complexes located in this state. The principal function of this laboratory is to conduct various chemical and biological analyses on samples submitted to this organization by investigating teams from this office, Waste Disposal Inspectors, individual citizens, and many industries.

The data obtained from the laboratory tests are interpreted and evaluated by members of the staff which includes: biologists, bacteriologists, chemists, biochemists and engineers. The conclusions and recommendations of these individuals are then forwarded to the individual or industry concerned.

The three major questions confronting this organization are:

1. What effect will the discharge of a given volume of a specific waste product have upon the physical, chemical and biological properties of a stream?
2. What type of corrective treatment is necessary before said waste can be discharged into a stream?
3. How long will it take a given stream to recover from the discharge of this waste?

During this past biennium, many samples have been submitted to this organization for various types of analyses. Some of the types of waste material investigated are:

a. Phenolic wastes from petroleum & chemical industries.
b. Silty residues from gravel pit washings.
c. Brine wastes from petroleum fields.
d. Process and wash water from sugar mills.
e. Process and wash water from canneries and food processing plants.
f. "White Water" and wash and process waters from pulp and paper mills.
g. Septic tank influents and effluents.
h. Wash waters, spoiled fluids, and paunch contents from slaughter-houses.
i. Acid and alkaline wastes from chemical industries.
j. Toxic wash waters and liquors from metal plating and chemical industries.
k. Oily residues from petroleum industries.

The most important analysis of decomposable organic matter by means of aerobic biochemical action is referred to as the Biochemical Oxygen Demand (BOD). The BOD analysis furnishes the worker with a means of determining the amount of oxygen required by microorganisms to decompose a given amount of organic waste matter. The numerical value of this test is usually expressed in parts of oxygen per million parts of waste matter. Knowing the BOD value of a specific waste and various other factors, such as rate of flow and temperature of the receiving stream, we can calculate the ability of this stream to assimilate a given volume of this waste.

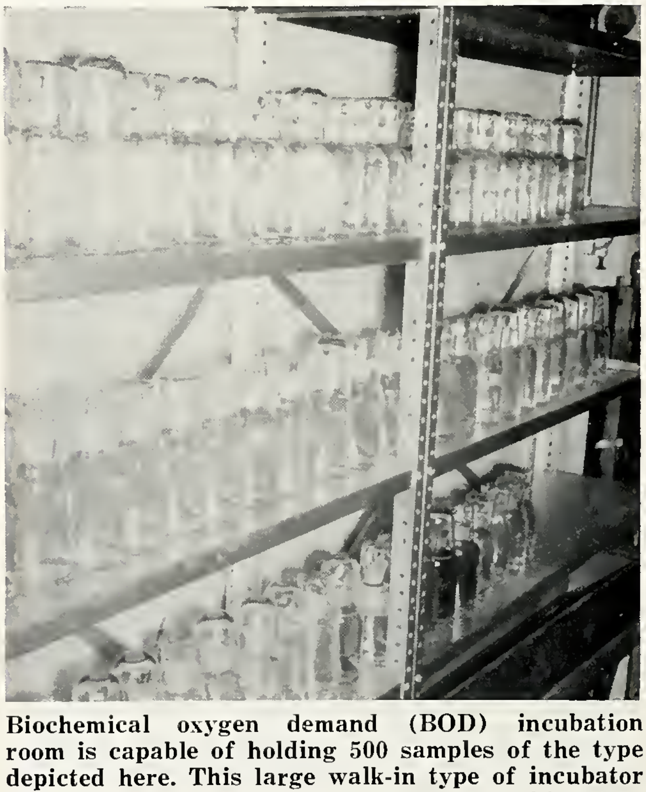
The procedure used in carrying out a BOD analysis is as follows: Various quantities of the sample to be tested are prepared in duplicate. These are then mixed with "dilution water", distilled water to which various mineral salts have been added, which has been saturated with oxygen. The dissolved oxygen (DO) concentration is immediately determined on one-half of these samples. The remaining samples are placed in a constant temperature room where they are allowed to incubate for five days at 20°C. Following this period of incubation, the residual dissolved oxygen is measured and the BOD values are computed.

BOD ANALYSES CONDUCTED DURING 1960-1961

Sample Origin	*No. of Samples Analyzed*	*Percent of Total*
Sugar Mills	478	19.4
Municipal Sewage	7	0.3
Food Processing Plants	262	10.6
Mississippi River	792	32.2
Slaughter Houses	42	1.7
Paper Mills	304	12.3
Petroleum and Chemical Plants	147	6.0
Miscellaneous	431	17.5
TOTAL	2,463	100.0

Another method of analysis used for measuring the relative strength of a waste material, particularly when the biochemical oxygen demand cannot be determined, is the chemical oxygen demand or COD. The values obtained from BOD and COD determinations cannot be directly correlated as the COD indicates only a part of the organic matter oxidized, depending upon the chemical oxidant used and the structure of the organic matter present. BOD analyses, on the other hand, reflects the total oxidation of organic matter.

Briefly, the procedure for carrying out the COD analysis is as follows: an aliquot of the sample to be tested is oxidized using potassium dichromate and sulfuric acid. Following a suit-



Biochemical oxygen demand (BOD) incubation room is capable of holding 500 samples of the type depicted here. This large walk-in type of incubator also serves as a dark room for polarographic work.

able period of reflux (2 hours), the sample is cooled and the excess dichromate is titrated with a standard ferrous ammonium sulfate solution.

STREAM POLLUTION FROM SUGAR FACTORY DISCHARGES

During the 1959 sugar cane grinding season, a moderate increase of average pounds BOD per day discharged was noted. Early freezing weather was at least partially responsible for the deterioration in quality of waste water discharged into state streams. In a few instances factory capacity expansion accompanied by equipment malfunction brought about the discharge of a less desirable quality of waste water to the streams.

The 1960 grinding season appears to have been one of the better grinding seasons in the past six or seven years. Dissolved oxygen content was recorded at acceptable levels in virtually all streams that receive sugar factory waste discharge. To be specific, only Bayou Black, several miles west of Houma, Louisiana, became depleted of dissolved oxygen for short periods during the cane grinding season. No fish mortalities could be directly attributed to effects of sugar factory waste discharges.

The quality of sugar factory waste discharged into state streams has continued to improve over the past seven years; the data listed below support this statement.

POUNDS PER DAY BOD
DISCHARGE PPM BOD
Mills Discharging into Bayou Teche

Year	*PPM-BOD*	*Average Pounds/Day*
1954	161.0	53,501
1955	113.4	37,660
1956	117.0	34,812
1957	86.6	25,767
1958	80.4	19,971
1959	92.5	21,500
1960	61.5	15,600

At this writing, the 1961 sugar cane grinding season is approximately 60% complete. To date, two complaints relative to pollution from sugar factory discharges have been received by this Division. The two streams involved in these two instances are presently under close surveillance; efforts to correct or abate the causes of stream contamination in both cases are underway.

Proposals by the Louisiana Department of Public Works to increase the volume of flow into Bayou Teche from the Atchafalaya basin would very definitely improve stream conditions during the grinding season to the extent that virtually all pollution problems would be solved in this watershed.

These extraction assemblies are used in the initial separation of oil from bottom muds collected from the bay and offshore areas.

OIL DETERMINATIONS

Analysis of oily, waxy, and greasy residues in water and bottom muds requires a great deal of time by the personnel of this Division.

When received in the Baton Rouge laboratory, the mud is dried, pulverized and weighed amounts are put into extraction thimbles. This thimble is suspended in a cylinder to which has been added a sufficient volume of solvent to remove all oil from the soil sample. Next, sulphur is removed with copper, and chromatographic treatment absorbs other impurities. The oil and solvent are then separated by distillation. Following this, the oil is weighed and identified by infra-red spectroscopy.

Eliminating impurities from a crude oil extract using column chromatography.

Samples containing enough oil to form two layers of liquid within the same sample, but which are not muddy, are extracted using the two phase equilibrium principle. A solvent suitable for oil extraction is vigorously mixed with oil-contaminated water for several hours, during which time the oil dissolves in the solvent. Repeating this process completely removes the oil from the water. The solvent is evaporated and the resulting oily residue is weighed.

Subsequent column chromatographic techniques separate the crude hydrocarbons from extraneous material that may be present. This is effected by allowing the crude extract to pass through an absorbing column of material using a suitable solvent as a vehicle. Hydrocarbons immediately pass through this column while extraneous material is absorbed.

Spectrophotometric analysis, using a Beckman infrared spectrophotometer, allows definite identification of crude oil or crude oil components.

The certainty to which this identification can be made must not be underestimated. Rarely will two or more distinctly different chemicals exhibit the same infrared spectral picture. Therefore, when a spectrum of an unknown is identical to one of a known material, conclusive identification can be made. During this last biennium this organization has collected a library containing in excess of 2500 spectra of known chemicals.

Evidence of the value of infrared analysis can be seen in the accompanying spectral reproductions which show how hydrocarbons from oil were found in a crude extract.

THE WATER QUALITY PROGRAM

The Water Quality Program of the Water Pollution Control Division was begun during the last biennium and has been continued during the past two years. Water samples have been collected from streams throughout the state covering the major watersheds. Through quantitative chemical analysis, data has been made available to the Division Chief of Water Pollution Control, to the Louisiana Wild Life & Fisheries Commission, and to the Louisiana Stream Control Commission, as well as to all citizens interested and/or concerned with the quality of Louisiana's waters.

Waste Disposal Inspectors assigned to geographic areas collected the samples during the first week of each month and immediately made certain chemical and physical tests. Forty-one samples from some thirty streams were then shipped to the Baton Rouge Laboratory of the Division of Water Pollution Control. Upon receipt, chemical and physical analyses were completed by the technical personnel using methods prescribed in "Standard Methods for the Examination of Water, Sewerage, and Industrial Waste", Tenth Edition, prepared and published jointly by the American Public Health Association, the American Water Works Association, and the Federation of Sewage & Industrial Wastes Associations.

In conclusion, the Water Quality Program has proved to be an essential activity of the technical section of the Division of Water Pollution Control in that it has provided factual information regarding the chemical quality of our waters which is as vital to progress as quantity of water. Therefore, the program is to be continued, enlarged if necessary, and changed to meet the demand for complete, accurate information used to conserve Louisiana's water resources.

MISSISSIPPI RIVER SURVEY

The Mississippi River Survey has been continued along the same lines it has followed since its initiation in December of 1957. However, its scope has been broadened in several ways during the past two years even though its objectives have remained the same.

Basically, this program is an intensified water quality survey of a single stream to determine the natural variations in the chemical and physical characteristics of the water and the effects of the existing industrial discharges on these characteristics.

This knowledge is necessary to maintain the availability of good quality water for domestic and industrial users along the lower Mississippi River and is of value to the Division in its capacity as technical advisor to the Stream Control Commission. In addition, information derived from this survey has been furnished to prospective industries on numerous occasions.

Several changes have been made in the Mississippi River Survey in the past two years. The stretch of river encompassed has been extended and now covers some eleven stations (formerly eight) located from mile 235.4 AHP, upstream from the Baton Rouge industrial complex, to mile 118.7 AHP, downstream from the Norco-Luling industrial area.

Following an unfortunate spill of a large quantity of phenol by an industry in the Baton Rouge complex that occurred in January of 1960 and caused the water supplies of several downstream municipalities to become unpalatable, two new phases of the Mississippi River work of the Division were initiated in which industries located on the river were asked to participate on a voluntary basis.

In the first program, through cooperation with the Louisiana Department of Public Health, industries that discharge waste into the river, and municipal waterworks and industries that draw their raw water supplies from the river, an Emergency Warning Network was established. Under this program, any industry that has an unusual discharge or spill into the river immediately notifies the Division office in Baton Rouge and the Public Health Engineer in New

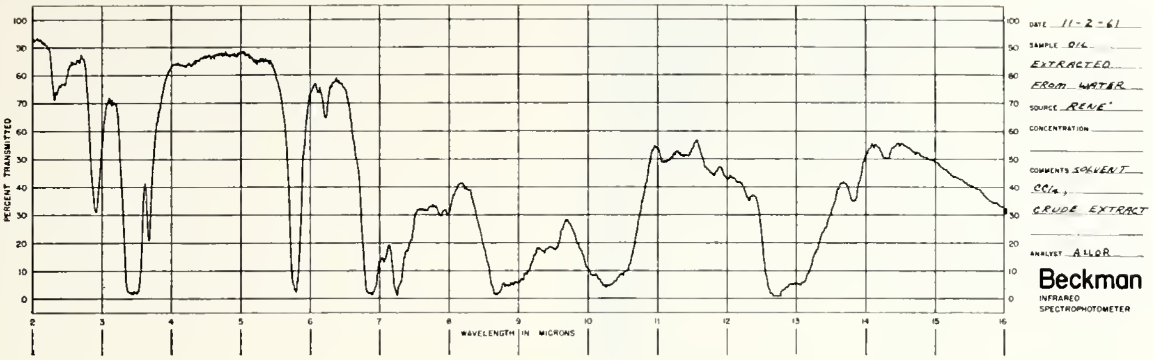


FIGURE 6

Infrared Spectrum of Oil from a Crude Mud Extract

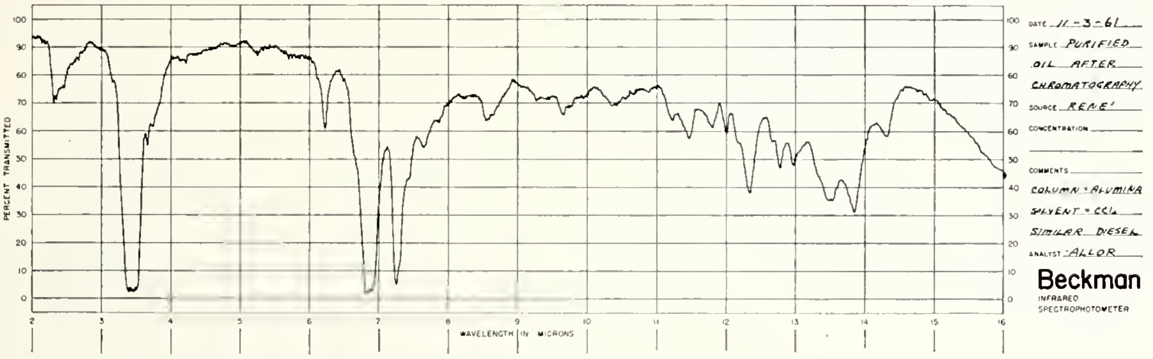


FIGURE 7

Infrared Spectrum of Purified Oil from a Crude Mud Extract after adsorption Chromatography

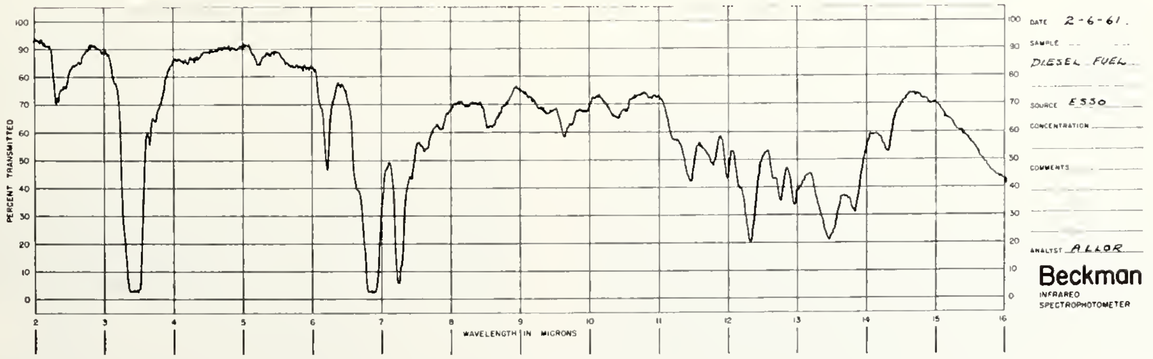


FIGURE 8

Infrared Spectrum of Diesel Fuel, A Known Petroleum Derivative.

Chief Chemist, L. R. Kuss, is testing samples from the Miss. River survey for bacteriological purity. These inoculated tubes will be incubated as part of the procedure in the determination of harmful bacteria.

Orleans and is advised as to whether or not the downstream water users should be warned of the occurrence. If it is deemed advisable, the responsible industry notifies downstream water users who then, allowing for the time of arrival of the material, can make necessary adjustments. These downstream users in turn, notify the more downstream network members of the time of passage of the material. The network has been put into operation several times since its formation with very satisfactory results.

Under the second program, industries discharging wastes into the Mississippi River were requested to submit weekly composite analyses of the chemicals contained in their discharges. This phase was carried through one year. At present, the reporting of materials is limited to substances which tend to be toxic such as heavy metals and organics which tend to impart an objectionable taste or odor to domestic water supplies.

It must be stated that the industries have been most cooperative in connection with these two programs. Moreover, the resulting increased awareness of industries of their discharges and spills has brought about improvement in waste treatment facilities at several plants.

PEARL RIVER SURVEY

A survey of the Pearl River below Bogalusa was initiated in March, 1961 and will continue throughout this year. The purpose of this survey is to accumulate sufficient data, both chemical and biological, that necessary corrective measures might be found to improve the quality of this water source.

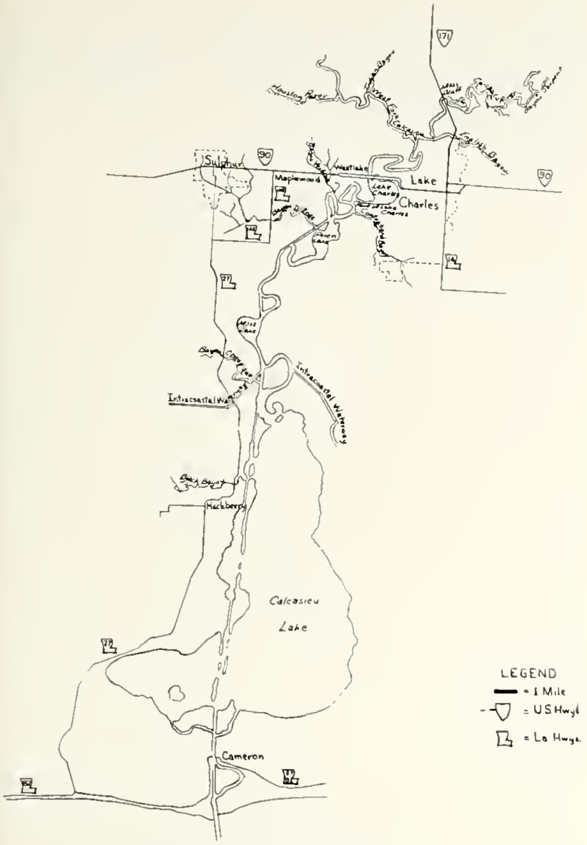
The area under study encompasses approximately thirty miles of the Pearl River—beginning about one mile above Bogalusa Creek (Control Station) and terminating at Waukiah Bluff. Ten sampling stations have been set up in this area and these sites are sampled monthly. These samples, both water and bottom muds, are subjected to a rather complete biological and chemical analyses.

The data obtained during the first few months of this survey indicate that the condition of the Pearl River is undesirable. This project was facilitated by the temporary stoppage of production at the largest industrial plant discharging into the Pearl River. This reprieve, which has lasted in excess of 120 days, has given this organization the opportunity of evaluating this stream while it is in a relatively satisfactory condition.

Data obtained from this project will be used in a system for classifying water bodies throughout this state. In effect, maximum limits will be imposed on some streams and these limits shall not be violated by industrial discharges.

CALCASIEU RIVER SURVEY

A survey of the lower Calcasieu River basin was begun in September, 1961 and, though still in its formative stages, is progressing rapidly. Twenty seven sampling stations have been designated in such a pattern as to illustrate river conditions from the river mouth upstream for 67



Calcasieu Survey Area

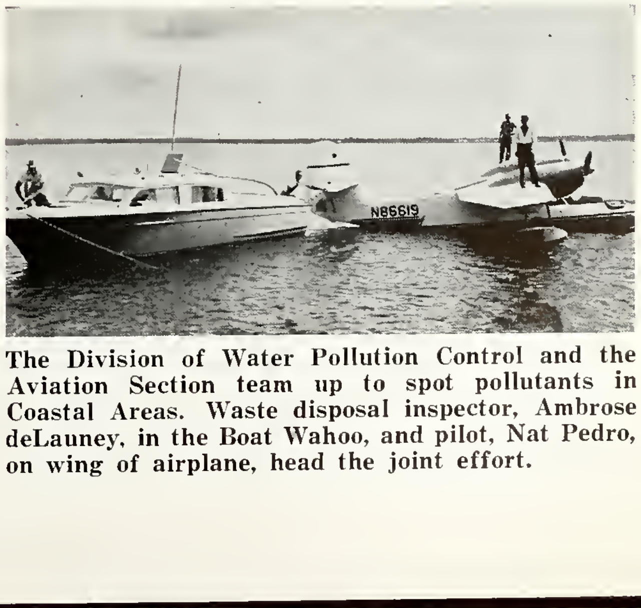
miles. Seven stations, considered to be major points, are sampled weekly. These stations are felt to summarize water conditions of the entire test area. The other twenty stations are minor stations which are sampled once every six weeks to obtain detailed information about water conditions in certain small areas of the river and to help analyze data from the major stations. These minor stations are located near known outfalls of pollution and at other strategic points along the river.

Preliminary data seem to indicate that, on the basis of water conditions, the Calcasieu River consists of three regions. The upper or fresh water region is north of Lake Charles (See Map). Water in this region usually exhibits lower chemical content than does the water in the other two regions. From Lake Charles southward to Moss Lake is located the middle region in which salt water moving up from the Gulf of Mexico via the 35 foot deep Calcasieu Ship Channel mixes with fresh water from upstream. Water in this region shows widely fluctuating chemical content ranging from low fresh water values through the relatively high values characteristic of the very brackish lower region to values characteristic of industrial waste "dumping". This middle, mixing region encompasses the greater portions of the Lake Charles industrial complex and of the open waters available for recreational activities. The lower or very brackish water region extends from the Intracoastal Waterway south of Moss Lake to the Gulf of Mexico. Values from tests conducted on water from this region have shown little difference from the relatively high values characteristic of waters in close proximity to the open sea.

It has been interesting to note that organic pollution as indicated by high coliform counts and black sediments is found in the survey area from Lake Charles southward only. Oily wastes as characterized by oil slicks in bottom sediment samples are found from the Port of Lake Charles southward. Another interesting point noted is that a prolonged wind from one direction, especially north or south, can cause a hundredfold, or even a thousandfold change in all test values.

Analytical tests to be conducted on samples taken at the twenty seven stations include water chemistry (conductance, alkalinity, pH, solids, chlorides, hardness, and sulfates), bacteriological measurements (biochemical oxygen demand, coliform counts, and fecal coli counts), and biological techniques (plankton and fish nets, light penetration, and trawls) including a newly devised aquatic invertebrate sampling method which will be used for the first time by the Division of Water Pollution Control.

The new biological sampling method as devised by personnel of the Division involves attracting aquatic invertebrate animals in an area by providing habitats for them. The habitats (called traps by the more blase' of the workers) are constructed from hardware cloth, rubber matting, wood, glass, bricks, plastic, and anything else to which macro-plankton might be attracted (See Picture). The trap is allowed to remain in a sample area for a predetermined period, then is removed, placed in a plastic bag or bucket, and taken to surroundings more suitable and comfortable than a wind-or wave-tossed open boat for the counting and identification of invertebrates. From preliminary test runs, it is believed that the traps will prove faster, more convenient, and



The Division of Water Pollution Control and the Aviation Section team up to spot pollutants in Coastal Areas. Waste disposal inspector, Ambrose deLauney, in the Boat Wahoo, and pilot, Nat Pedro, on wing of airplane, head the joint effort.

more indicative of the faunal populations than dredging techniques presently in use, thus greatly facilitating the ecological survey of the Calcasieu River.

Relatively little is known about present ecological conditions in the lower Calcasieu River basin. A geological and chemical survey was conducted between 1949 and 1951 by the U. S. Geological Survey in cooperation with the Louisiana Geological Survey. The Southwest Louisiana Agriculture Committee on Stream Pollution monitored daily salinities at nine points in the watershed from 1948 to 1955. The Coastal Studies Research Institute centered at Louisiana State University has studied ecological conditions of the coastal regions of Southwest Louisiana but did not deal specifically with the Calcasieu River watershed. The Louisiana Department of Health has recently conducted a survey concerned with the bacteriology and salinity of the watershed which is nearly complete but not yet published. The Calcasieu River Survey being conducted by this Division is designed to include, augment, and extend previous studies into a comprehensive limnological survey of the watershed including chemical, bacteriological, meterological, and biological considerations.

A mobile laboratory modified from an 8 ft. X 30 ft. house trailer is being outfitted by the Division which will be used to facilitate the Calcasieu River Survey. Current plans call for operation of the mobile laboratory in the Lake Charles area for about two years with movements to other sections of the state as needs arise.

An ecological survey has been long desired and needed in the Calcasieu-Cameron area of the Calcasieu River watershed. In this region is located one of the largest industrial complexes in Louisiana. Industries requiring river water in this complex include eight chemical plants, two oil refineries, a cement plant, a synthetic rubber facility, an electrical power plant, two fish-oil processing plants, and a rice mill. These industries require more than 400,000,000 gallons of river water daily. Agriculture levies a heavy toll on clean river water from the Calcasieu River watershed by requiring irrigation water for more than 50,000 acres of farm land. In addition, almost all of the aforementioned industries along with three ship and barge repair installations, twenty-four producing gas and oil fields, three oyster-shell loading sites, a sawmill, numerous small boats, tugs, and barges, and three cities and five towns with a combined population of nearly 95,000 use the Calcasieu and its tributaries for waste disposal. These heavy requirements for relatively clean river water and for disposal of waste products coupled with the salt water encroachment up the man-made Calcasieu Ship Channel add up to the fact that the available water resources of Southwest Louisiana, both ground and surface, are being taxed to the limit. It sometimes seems that Providence plays a large role in keeping the Calcasieu River from "going septic" (in spite of all man can do) by sending those Southwest Louisiana monsoons known to the natives as "rainy season".

MOBILE LABORATORY

The Division of Water Pollution Control will soon have a mobile laboratory. After its delivery, a used 30 ft. x 8 ft. house trailer will be stripped to the walls and built up into a compact, nearly self-contained aquatic research facility. Present design calls for facilities to accommodate two laboratory and two field workers. Equipment in the mobile laboratory will include apparatus for routine water chemistry, including alkalinity, pH, hardness, chloride, sulfate, turbidity, conductance, and solids determinations; bacteriological measurements, including biochemical oxygen demand (BOD), coliform counts (MPN), and fecal coli; and biological measuring devices, including plankton and fish-life counts, invertebrate traps, light penetration, and dredging.

The mobile laboratory will supplement present Division laboratory facilities. Routine analyses only will be conducted with more intricate measurements being made by the Baton Rouge laboratory as is the current procedure. The mobile laboratory will allow extensive testing in an area of the state without undue strain on present necessary routine work.

Field work will be facilitated in a test area since analyses may be conducted "on the spot". In emergency situations, such as fish kills, data on which recommendations may be based will be available more quickly than is presently possible. For stream survey work, the data gathered will be processed near its source; thereby more nearly reflecting stream conditions.

At first, the mobile laboratory will be assigned to Southwest Louisiana in the Calcasieu River Survey. It will be available for movement on very short notice to any section of the state as needs arise.

FISH KILLS

The Division has investigated numerous fish kills during the past two years. These have included both natural kills and kills attributable to activities of man. Waters in which these kills have occurred ranged from farm ponds (an accommodation to the public) to the two largest rivers in the state, the Mississippi and the Atchafalaya.

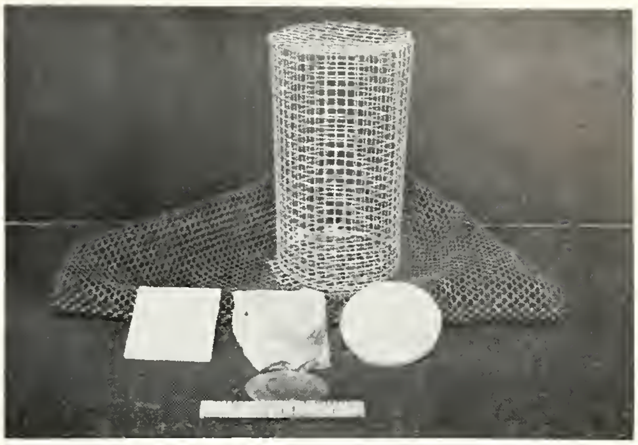
Most of the natural kills have been the result of oxygen depletion caused by heavy blooms of plankton in the spring and early summer. The vast majority of these have occurred in farm ponds with a few having been in small sluggish streams or lakes.

The most spectacular fish mortality ever noted in Louisiana, one which was to demand a great part of the time of several staff members for several months, and result in the loss of untold tons of fish, started with the report of a fish die-off in the Atchafalaya River near Krotz Springs on November 17, 1960. This was rapidly followed by reports of fish die-offs from widespread areas in the Mississippi River and the Atchafalaya River Basin. Ultimately, mortality was noted in the Mississippi River from Lake Providence (mile 480 AHP) to Venice (mile 10 AHP) and in the Atchafalaya drainage from Old River to Morgan City. Fish were neither reported nor observed dying in the Atchafalaya drainage (Red and Black Rivers) above the Old River connection with the Mississippi River. However, mortality in speckled trout and other marine forms were noted in brackish bays near the mouth of the Mississippi.

Species of fish affected in the Mississippi and Atchafalaya included catfish, carp, fresh water drum, and threadfin shad. Approximately 95% of the fish dying were catfish. In addition, most of the catfish found dead or dying, particularly in the backwater areas of the Atchafalaya Basin, were thought to be from the 1960 hatch. These fish were six to eight inches in length and weighed one-half to three-fourths of a pound. However, proportionate numbers of larger specimens were noted including a few large individuals weighing 25 pounds or more.

Dissolved oxygen and pH determinations were made at all locations where dead or dying fish were checked by Division personnel. In all cases the pH fell within a satisfactory range of from 6.8-8.2 and the dissolved oxygen content was in excess of 7 ppm and approaching saturation for the prevailing water temperatures.

Repeated observations of dead or dying fish revealed several rather constant phenomena. Most of the catfish were noted to be hemorrhaging around the mouth and many were hemorrhaging about the fins, particularly the pectoral fins. In every instance the catfish were observed to have a distended abdominal area. Gross examination revealed that the distention was due to distention of the air bladder and digestive tract. The latter was devoid of food material and contained only gas or air and a very small amount of frothy material. This in spite of the fact that analysis of the bottom fauna revealed an abundant food supply consisting of snails, clams, leeches, oligachaets, may fly niads, gammarids, fresh water shrimp, and chironomids. Dying fish were swimming at the surface (often inverted) in a very lethargic manner and were easily captured by hand. However, even though they were at the surface, the fish exhibited no gulping actions as are noted in case of respiratory difficulty. Another feature noted was belching of large quantities of air or gas by some of the catfish.



Aquatic Invertebrate Trap: The flexible rubber matting is shaped into a pocket into which the ceramic tile, polyethylane disc, wood, and glass are placed. The resulting sac is wired to the top of the hardware cloth cylinder and the brick added for weight.

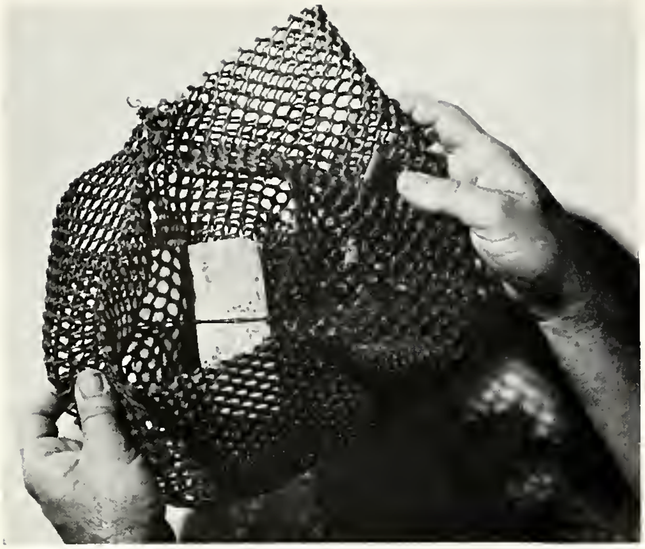
Repeated attempts were made to bring affected fish into the laboratory with the intent to expose healthy fish from another area where no fish mortality had occurred. Of the numerous fish collected, only four individuals survived the trip to the laboratory and these recovered completely. Two healthy fish held in the tank with these four individuals showed no ill effects.

Extractions of organics with carbon tetrachloride were made from bottom muds in the affected area and the extracts subjected to infrared and paper chromatography analyses. These techniques have offered no clues to possible causes of mortality.

Mud samples and fresh water clams were sent to the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, for analysis and identification of insecticides as a possible cause of the fish mortalities. The results of this phase of the investigation were negative. Dead or dying fish were frozen and shipped to Dr. S. F. Snieszko, Microbiological Laboratory, U. S. Fish and Wildlife Service, Kearneysville, West Virginia. In addition, fish, clams, and mud samples were submitted to the Patuxent Research Center, U. S. Fish and Wildlife Service, Laurel, Maryland. The materials shipped to Dr. Snieszko arrived in poor condition due to thawing and the results of examinations were inconclusive but indicated possible presence of abdominal dropsy.

More detailed examination of specimens in the laboratory of the Division indicated considerable degeneration of the digestive tract, spleen, and other portions of the viscera. Bacterial cultures were made utilizing parts of the viscera and blood of affected fish and tests conducted on these cultures indicated the presence of *Aeromonas liquefaciens*, the causative organism for abdominal dropsy in fish.

Mortalities gradually decreased through Jan-



Flexible matting packet ready to be inserted in a hardware cloth cylinder for use as an invertebrate trap.

A fish exercising apparatus used for determining respiratory patterns. Water, introduced at one end of the cylinder, creates a current and causes the fish to exert energy during the test.

uary and eventually ceased in early February with the beginning of the late winter and early spring rise of the Mississippi River. There seems to be little doubt that the disease broke out farther up the Mississippi and spread down the Mississippi and Atchafalaya. It is interesting to note that at the same time, fish dropsy was encountered in the tanks of minnow dealers receiving their stock from several breeders in Arkansas.

Another interesting fish kill was one that occurred during the summer of 1960 in a small lake on the campus of Louisiana State University and on which the Division staff worked in close cooperation with Dr. Jess Muncy of the University staff. Analysis of conditions revealed a high oxygen content (always in excess of 8 ppm), a high pH (not less than 9.5 and at times higher than 11), and a heavy bloom of green algae (predominately a species of the genus Gymnodinium). Bioassay showed that neither the high pH alone nor the presence of the species of Gymnodinium alone caused mortality, but the two together caused rapid mortality of the test fish. It is interesting to note that no species of Gymnodinium had previously been reported to be toxic.

Within the past two years fish-kills attributable to activity of man have become more numerous and more serious than those occurring naturally. Foremost among the activities contributing to fish mortalities is the widespread use of insecticides, particularly the use of Endrin in dusting sugar cane for control of the cane borer. It is the experience of the Division that fish kills in streams in the vicinity of canefields may be expected following any rain that falls during the cane dusting season. We attribute this to Endrin carried into the streams by runoff from the cane fields even though we are not able to detect the presence of Endrin in the streams. However, it must be kept in mind that Endrin is capable of killing fish at a concentration of five parts of Endrin per billion parts of water. Thus, one-half the amount of Endrin applied to an acre of cane in a single dusting is capable of producing a lethal concentration in one acre of water seven feet deep. To perform an infrared analysis for Endrin in a concentration of 5 ppb, it would be necessary to have 100% extraction from 10,000 gallons of water, a full work load for the entire laboratory staff for a full year. During the past two years, the Division has investigated dozens of fish kills which we attribute to Endrin by eliminating other possible causes. Several of the kills must be considered as among the largest fish mortalities that have ever been noted in Louisiana. In two of them that occurred in the summer of 1961, one in Blind River and the other in a portion of the Intracoastal Waterway, the total kill was conservatively estimated to exceed 50,000 pounds of fish. Additional kills have been attributed to the use of Heptachlor in the fire ant control program.

In July of 1960, a major fish kill occurred in the Pearl River that resulted in an almost complete kill in thirty miles of the river. This fish mortality was caused by the dumping of a tank of so-called soap and resins by a paper mill in Bogalusa. Similar kills had occurred prior to this occasion. Following this kill, the Division was directed by the Stream Control Commission to re-evaluate the Pearl River below Bogalusa.

Additional fish kills have been caused in various localities by discharge of wastes with high organic loads from food processing plants which resulted in oxygen depletion in the receiving waters, accidental spills from chemical plants, turbidity from dredging operations, and discharge of toxic materials by tank cleaning operations.

BIOASSAYS

Biological assay tests using small fish and daphnids have been conducted using a number of substances received by the Division's laboratory from various sources. The purpose of these tests is to determine what concentrations of substances may be permitted in the waters of the state without harming the aquatic life.

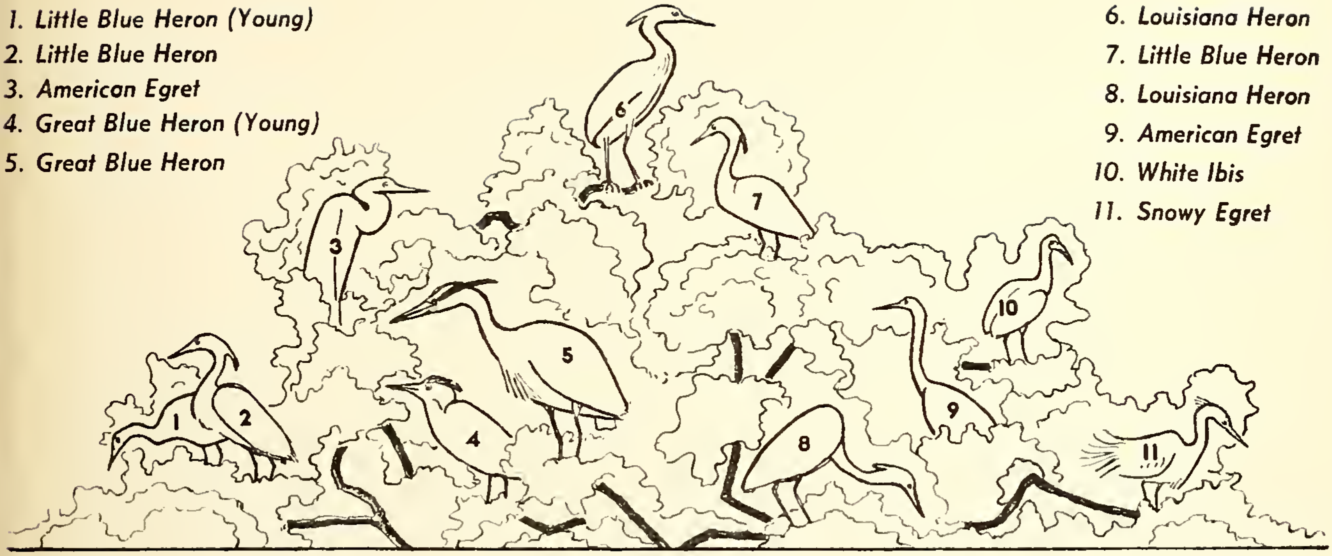
During this past biennium many types of substances have been subjected to this mode of analysis. Notable among those tested were the so called "emulsifiers", substances capable of emulsifying petroleum products and supposedly rendering them less objectionable for discharge into our waterways by preventing formation of oil slicks on the surface. A great percentage of these emulsifiers, all supposedly non-toxic, have been shown to be toxic in very small concentrations, usually below 5 ppm.

TECHNICAL PAPERS AND REPORTS, 1960-1961

1. Water Pollution In the Past And In the Sixties, Biglane, K. E., Louisiana Conservationist, pp. 7-9, February, 1960, and U. S. Congressional Record, pp. A2292-A2293, March, 1961.
2. Oil Field Brines and Catahoula Lake, Biglane, K. E., pp. 1-6, General distribution, August, 1961.
3. Louisiana Stream Control Commission Minutes; February, April, July, August, October, December, 1960 and February, April, June, November 10, November 21, December, 1961.
4. The Sugar Factory Pollution Abatement Program in Louisiana, Lafleur, R. A., National Sugar Journal, March, 1961.
5. Sugar Factory Pollution Abatement—The Case History of a Drainage Basin, Lafleur, R. A., 16th Industrial Waste Control Conference, Purdue University, Lafayette, Indiana, May, 1961.
6. Report on All Sugar Factories in Louisiana, Lafleur, R. A., General distribution, March, 1960.
7. Report on All Sugar Factories in Louisiana, Lafleur, R. A., General distribution, March, 1961.
8. Laboratory Analysis Methods Used by the Division of Water Pollution Control, Kuss, Louis R., Proceedings of the Twenty-Fourth Annual Short Course for Superintendents and Operators of Water, Sewerage, and Industrial Waste Disposal Systems, March, 1961.
9. Report on Herculese Powder Company, Lake Charles, Louisiana, Kuss, Louis R., General distribution, April, 1961.
10. Recent Field and Laboratories Activities of the Division of Water Pollution Control, Gregg, R. T., Proceedings of the Twenty-Fourth Annual Short Course for Superintendents and Operators of Water Sewerage, and Industrial Waste Disposal Systems, March, 1961.
11. Mississippi River Survey, Gregg, R. T., General distribution August, 1961.

2653-B, 3-62

1. *Little Blue Heron (Young)*
2. *Little Blue Heron*
3. *American Egret*
4. *Great Blue Heron (Young)*
5. *Great Blue Heron*
6. *Louisiana Heron*
7. *Little Blue Heron*
8. *Louisiana Heron*
9. *American Egret*
10. *White Ibis*
11. *Snowy Egret*



Published by

Division of Education and Publicity

Louisiana Wild Life and Fisheries Commission